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FREELAND FERGUS, M.D., F.R.F.P.S.G., F.R.S.E.,
President 1907-1910.

PROCEEDINGS
OF THE
ROYAL
PHILOSOPHICAL SOCIETY
OF GLASGOW

VOL. XLI.

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SESSION 1909-1910.

*Recent Researches in the Physical Chemistry Laboratory of the
University of Glasgow.* By FREDERICK SODDY, M.A.

[Abstract of Graham Lecture given to the Society,
3rd November, 1909.]

THE paper contained an account of experiments on the origin of radium begun in 1903 and continued in the Physical Chemistry Laboratory of the University since it was opened at the commencement of 1905. That radium had an origin, and that it was being continuously reproduced by a natural process, followed from the fact that it was continuously disintegrating into helium and other products, at a perceptible rate. It was known that about one two-thousand-five-hundredth part of any quantity of radium disintegrates per annum. This was now a direct estimate. The most recent determinations of Sir James Dewar on the amount of helium formed in a given time from a known amount of radium had confirmed it exactly. It followed that in the course of a few thousand years radium would entirely cease to exist were it not being reproduced in some way. From the disintegration theory put forward by Professor Rutherford and the author seven years ago it was possible to predict that uranium was the parent of radium. Uranium is disintegrating also, but with excessive slowness, not much more than one ten-thousand-millionth part disintegrating per annum, so that the quantity of uranium in the earth is scarcely diminished over long epochs of geological time. If this minute fraction that disintegrates turned into radium, the origin and maintenance of the latter element would receive a satisfactory explanation. If this view were the correct one, the ratio between the quantities of uranium and radium in all minerals should be a constant. For when equilibrium was attained by the successive products of disintegration, as much of each must be being formed as was disintegrating in each unit of time. This was illustrated by

means of a model in which a stream of water from a constant source flowed successively through a number of reservoirs, the outflow from the bottom of one reservoir delivering into the next. In course of time the quantities of water in the successive reservoirs attain a constant ratio, those reservoirs with large outlet tubes retaining less water than those with small outlets. The radioactive constant, or fraction of the radio-element undergoing disintegration in the unit of time, corresponded with the fraction of the total content of the reservoir flowing out in the unit of time. The period of average life of the radio-element, which is the reciprocal of the radioactive constant, corresponds to the average period of time a drop of water remains in the reservoir. In equilibrium, outflow and inflow are equal for all reservoirs. In the radio-elements the outflow, or rate of disintegration, is proportional to the radioactive constant λ multiplied by the quantity of the element. If λ_1 is the constant of uranium, and λ_2 the constant of radium, and if U and R represent the quantities of the elements in equilibrium

$$\lambda_1 U = \lambda_2 R$$

$$\text{or } \frac{U}{R} = \frac{\lambda_2}{\lambda_1}$$

The law holds true, generally, that the relative quantities of the members of a disintegration series are directly proportional to their periods of average life. That of radium is 2,500 years. If the ratio $\frac{U}{R}$ in minerals is known, the period of uranium can be calculated.

The work of Boltwood, Strutt, and M'Coy had proved experimentally that there was a constant proportion between the quantities of uranium and radium in all minerals. This was indirect evidence that uranium was the parent of radium. Boltwood and Rutherford had determined this proportion to be about 3,000,000 parts of uranium to one of radium, and from this it followed that the period of uranium was about 7,500,000,000 years.

The author had attempted to obtain direct evidence of the process by purifying a large quantity of uranium as completely as possible from radium, and then measuring the amount of radium from time to time to see if it increased. In some of this work he had the assistance of Mr T. D. Mackenzie, a Carnegie Scholar. The tests for radium were so delicate and accurate that it was now

possible to be sure of a change of one five-hundred-millionth of a milligram in the amount of radium in a pound weight of uranium salts. The principle of the method consisted in storing the uranium solutions in sealed glass flasks and periodically boiling out the gases present and introducing them into a sensitive gold leaf electroscope. The radium produced a gaseous emanation which discharged the electroscope, and from measurements of the rate of discharge by means of a microscope an accurate quantitative determination of the amount of radium present could be obtained. The instrument was calibrated by means of solutions containing a known quantity of radium, prepared from known weights of pitchblende, in which the percentage of uranium was found by analysis, and the quantity of radium deduced from this by the ratio referred to. Under the conditions of the experiments, if uranium had produced radium directly, the amount of radium formed in a single hour should have been detectable. But the years went by, and even after three years, in the later experiments with uranium purified with the utmost care by Mr Mackenzie, the growth of radium was hardly detectable. The correct explanation of this suggested itself from the first. If the change of uranium into radium were not direct, but if first a slow changing intermediate body were formed which then disintegrating produced radium, the failure to detect the growth of radium from uranium for the first three years would be explained. But it could be calculated that the intermediate body must have a period of at least 15,000 years, that is only $1/15,000$ part of it must change per annum, for the explanation to hold good. Confirmation was soon forthcoming. Both Boltwood and Rutherford discovered this slow changing intermediate body in the uranium-radium minerals, and showed that it produced radium from itself at a steady rate as time went on. Boltwood named it Ionium. It resembled thorium closely in its chemical reactions, and could be separated from minerals by the same operation as this element. It gave out an α -radiation of characteristic range—the lowest yet known, the α -particle being expelled at a lower initial velocity in this case than in any other.

The existence of this new intermediate body between uranium and radium naturally modified the problem. The conditions of the hydraulic model on the lecture table were modified to meet the new case, and actual experiments done to show how the growth of radium should proceed. It was shown, as Rutherford had

predicted mathematically, that the growth of radium would be extremely small at first, but that it should proceed approximately according to the square of the time. That is between the third and fourth year nearly as much radium should be formed as was formed in the whole of the first three years. The last year's work on the uranium preparations, prepared four years before, had borne this out. These had established a distinct production of radium though still excessively minute, which had proceeded regularly according to the square of time. Therefore there was now direct experimental evidence that uranium produced radium, but that there was an intermediate body changing probably even more slowly than radium itself. If it were the only intermediate body—(the known first product of uranium called uranium X was too short-lived to have any appreciable effect)—it could be calculated that its period of average life was 18,500 years. But there was evidence to show that one or more new relatively short-lived products also intervened, and in this case the calculated period would be too high.

During the last two years new experiments had been going on with very large quantities of pure uranium salts and powerful appliances, provided by the generosity of a friend, which had in connection with the other results, confirmed the view that there existed yet another intermediate body between uranium and radium. If the direct parent of radium, which gives α -rays, were the direct product of uranium X, which gives β -rays but no α -rays, then, upon separating the uranium X from a large quantity of uranium, as the β -rays of the uranium X decayed a feeble α -radiation should grow concomitantly. Several preparations of uranium X had been obtained from the uranium with the help of Mr A. S. Russell. In none of these had a growth of α -radiation occurred, although in some the decay of the β -radiation was now nearly complete. This bore out the view that another step took place between the disintegration of uranium X and the formation of the parent of radium. We clearly had not yet arrived at a complete knowledge of the successive transformations taking place in the uranium-radium series. Owing to the excessive periods of time involved progress was necessarily slow, but it was sure. The only method of overcoming this difficulty was by increasing the quantities of materials under investigation, but this was of necessity costly.

At the conclusion of the meeting two "gas lamps" filled with helium and neon respectively, consuming current from the Corporation mains and emitting several candle-power light, were exhibited. Great progress had recently been made in our knowledge of the means of making a gas conduct the current. In the opinion of many the electric light of the future would be a gas lamp. Although still far from practical realisation, the experiments showed that a great advance had been made in recent years over the old vacuum tubes worked by an induction coil.

It was known that the cathode surface was the seat of the enormous resistance of a gas to the discharge, and if this could be overcome, currents of moderate voltage could be made to flow through a gas as readily as through a wire. Professor Wehnelt had discovered that if the cathode were kept red-hot by making it out of platinum foil traversed by an auxiliary current, and its surface covered with lime, the discharge would pass through the gas with ease. This was the principle of the lamps shown. They furnished sufficiently powerful sources of pure helium and neon spectrum light to enable the spectra of these gases to be projected upon a screen and made visible to a large audience. As in the case of the mercury vapour lamp, the spectrum consisted entirely of the characteristic lines of the element. The neon lamp, in particular, on account of its splendid colour, gave a very brilliant light.

The Telescope.—An Address on the occasion of the Ter-centenary of its Invention. By ALEXANDER D. ROSS, M.A., B.Sc., F.R.S.E., Assistant to the Professor of Natural Philosophy in the University of Glasgow.

[Read before the Society, 17th November, 1909.]

THE early origin of the telescope, like that of many other scientific inventions, is lost in obscurity. The works of Roger Bacon, which were published in the thirteenth century, show that even in his time spectacles were known. Indeed the discovery at Nimroud of a rock-crystal lens has been taken as evidence that the Assyrians had some knowledge of elementary optics and the phenomenon of refraction. It therefore seems highly probable that many combinations of lenses must have been tried prior to the advent of the seventeenth century, which is usually regarded as the epoch of the invention of the telescope. Probably, as in the case of other important discoveries, more than one person hit upon the idea of the telescope, but, failing to recognise its value, they kept their discovery secret or employed it perchance in the demonstration of natural magic. When, however, in 1609 the instrument was recognised as a powerful appliance in the hands of the scientific investigator, a sharp discussion arose as to its early history. Dr Dee in his preface to a 1570 edition of Euclid's *Elements* refers to the advantages of "perspective glasses" to military officers in reconnoitring. Again Digges¹ states that "by concave and convex mirrors of circular and parabolic forms, or by paires of them placed at due angles, and using the aid of transparent glasses which may break, or unite, the images produced by the reflection of the mirrors, there may be represented a whole region; also any part of it may be augmented, so that a small object may be discerned as plainly as if it were close to the observer, though it may be as far distant as the eye can descrie." The son of Digges, writing in 1591,

¹ Digges, *Pantometria*, 1571.

stated that his father was able by means of optical arrangements to recognise a person at a distance of three miles and to read the superscriptions on coins lying out in the open fields. These statements are doubtless exaggerations, though it is probable that Digges employed some form of optical instrument.

In 1665, Borelli, a Dutch mathematician, published a book "*De Vero Telescopii Inventore*," giving the results of his inquiries on this vexed question. His conclusions, which seem to have been drawn with great care and impartiality, are in favour of Zachariah Jansen and Hans Lippersheim, two spectacle makers of Middelburg, Holland. As far as can be ascertained, the truth of the matter appears to be as follows:—An apprentice of Lippersheim's found that by employing two spectacle lenses one could see the weather-cock of a neighbouring church spire nearer and upside down. Lippersheim and Jansen thereafter fitted tubes with similar lens combinations, and one of those was bought from Jansen by the Marquis Spinola for Prince Maurice of Nassau. The Prince recognising the advantages of the instrument, desired the makers to keep their invention secret as he saw it might prove useful in the war which Holland was then waging against Spain. Adrian Metius and Cornelius Drebbel, however, also appear to have purchased telescopes from Jansen, and probably it was in this way that towards the end of 1609, Galileo, a professor at Padua, heard through a German friend of the invention. He does not seem to have received any particulars as to the nature of the lenses employed, for setting to work to construct a telescope for himself, he built one which, unlike the Dutch instrument, showed objects erect and not inverted.

While Galileo cannot be regarded as the inventor of the telescope, he was unquestionably the founder of telescopic astronomy. His first instrument, which magnified only three times, was presented to the Senate of the University of Padua, and a second telescope was constructed with a magnifying power of thirty. With this equipment Galileo scrutinised the features of the moon, estimated the heights of lunar mountains, determined the true nature of the Milky Way, and discovered sunspots, the phases of Venus, the four chief satellites of Jupiter, and the peculiar appearance of the planet Saturn. Surely such a record is sufficient to win for Galileo a foremost place amongst the pioneers of science !

But Galileo's work was not all a course of plain sailing. His discoveries were obnoxious to many of the philosophers and theorists of his time, and he had to substantiate his observations against a determined and organised opposition. Some there were, though few in number, who frankly admitted that their hypotheses must be kept subservient to observation. Thus, after the discovery of Jupiter's four satellites, Kepler wrote to Galileo as follows :—"I was sitting idle at home and thinking of you, most excellent Galileo, and your letters, when the news was brought me of the discovery of four planets by the help of the double eye-glass. . . . I immediately fell to thinking how there could be any addition to the number of planets without overturning my *Mysterium Cosmographicon*, published 13 years ago, according to which Euclid's five regular solids do not allow more than six planets round the sun. But I am so far from disbelieving the existence of the four circumjovial planets that I long for a telescope to anticipate you if possible in discovering two round Mars (as proportion seems to me to require), six or eight round Saturn, and one each round Mercury and Venus."

As an illustration of the opposite school we may take the following extract from a speech of Francesco Sizzi, a Florentine astronomer :—"There are seven windows in the head, two nostrils two eyes, two ears, and a mouth ; so in the heavens there are two favourable stars, two unpropitious, two luminaries, and Mercury alone undecided and indifferent. From which and many other phenomena of nature, such as the seven metals, etc., which it were tedious to enumerate, we gather that the number of the planets is necessarily seven. Moreover, the satellites are invisible to the naked eye, and therefore can have no influence on the earth, and therefore would be useless, and therefore do not exist."

Galileo jestingly replied that these arguments were so weighty that had he heard them earlier he would have been convinced that no more than seven members of the solar system could be discovered, but now that he had found four others he did not consider the arguments sufficiently strong to destroy the new satellites which had been seen.

For some years the battle went on. Many who had observed the satellites in the telescope refused to believe their eyes, and asserted that while the instrument was reliable for terrestrial work,

it was altogether false and illusory when applied to the heavens. Finally, however, the value of the telescope in astronomical research was generally admitted, and the first epoch in the history of telescopic astronomy was concluded.

The early telescopes were of the type known as the refractor. They consisted of a converging lens as object glass, which by bending or refracting the rays of light from a distant object formed a minute image. This image was then magnified by a convex or concave lens as eyepiece, according as the instrument was of the astronomical (or inverting) type or of the Galilean (or erecting) type.

About 1639, Mersenne advocated the use of a concave mirror in place of an object glass in the telescope, an idea originally due to Descartes. In 1663, Gregory constructed the first telescope embodying this principle. Other types of reflectors were subsequently brought out by Newton in 1672, by Cassegrain in 1674 and by William Herschel in the following century. In all these a large concave spherical or paraboloidal mirror forms by reflection an image of the distant object, which image is subsequently magnified by a simple or compound eye-piece lens combination. To permit of the observer standing in a convenient position a small concave, plane, or convex mirror is inserted in the optical system between the large concave mirror and eyepiece; or else the former is set with its axis slightly inclined to that of the telescope tube.

There are two defects in telescopes, the minimising of which has involved many years of labour. These are known as chromatic and spherical aberration.

Chromatic aberration is found only in refracting telescopes, and is due to the fact that rays of light of different shades of colour are bent by different amounts in passing from one medium to another. Thus when a beam of composite light passes from air into glass, or glass into air, the blue constituents are deviated more than the red. A narrow pencil of white light received into a telescope from a distant object is in this way dispersed by the lens into innumerable beams of coloured rays which are directed towards different points. The blue rays come to a focus nearer the object glass than do the red rays, and so the image on which the eyepiece has to be focussed is wanting in sharpness. In 1729 Mr Chester More Hall, of Essex, suggested the employment of a compound

lens to remedy this fault, but the idea was not then adopted. In 1758 it was revived by Dollond and put into practice. The form of compound—or achromatic—lens generally used consists of a converging lens of crown glass and a diverging lens of flint glass. While the refracting power of the latter is less than the former, its dispersive power is about the same, and hence the combination acts like a single convex lens as far as the formation of an image is concerned, and does not give rise to any appreciable colouring or want of sharpness in that image.

Spherical aberration is found both in reflecting and refracting telescopes. It is due to the fact that the points at which rays of light are brought to a focus by the central and peripheral parts respectively of a lens or mirror are in general somewhat different. The resultant want of sharpness in the image may be reduced by using telescopes of great focal length as compared with the diameter of the objective lens or mirror. In the seventeenth century many telescopes were accordingly made having lengths exceeding 100 feet, but they were unsatisfactory on account of their great weight and liability to flexure. The aberration can be almost entirely removed, so far as parallel beams of light are concerned, by giving the surfaces of mirrors and lenses a paraboloidal figure, but such a method is exceedingly expensive and troublesome. In practice it is usually sufficient to reduce the spherical aberration of lens surfaces to a minimum by arranging the curvatures so that the rays of light make approximately equal angles with both surfaces of each lens. Triple lens combinations can now be obtained practically free from both spherical and chromatic aberration.

There is another cause in addition to the foregoing which prevents a point source of light from being seen as such in the telescope. This cause is diffraction. In consequence of it a star appears in the telescope as a tiny disc surrounded by a series of concentric rings which become fainter and closer together as we go outwards. This is shown in Fig. I. (*a*). The greater the diameter of the object glass or mirror of the telescope the smaller is the scale of this ring system. In the case of a close double star there will be two such ring patterns almost superposed (Fig. I., *b*), and the two component stars can be resolved only if the centre of the disc of one is at least as far off as the first dark ring in the pattern given by the other. This is shown in Fig. I. (*d*), which is the curve of light intensity of a double star—the resultant of

two intensity curves for single stars (as in Fig. I., *c*) which do not exactly overlap. The double star is resolved if the observer is able to distinguish the *double* maximum. It is clear then that the resolving power of a telescope increases with diminution in size of the diffraction pattern, and hence with increase of diameter of the object glass or mirror.

A telescope with a clear aperture of x ins. diameter is more powerful than a similar telescope with a clear aperture of $x/2$ ins., for the following reasons. (1) The telescope gathers up

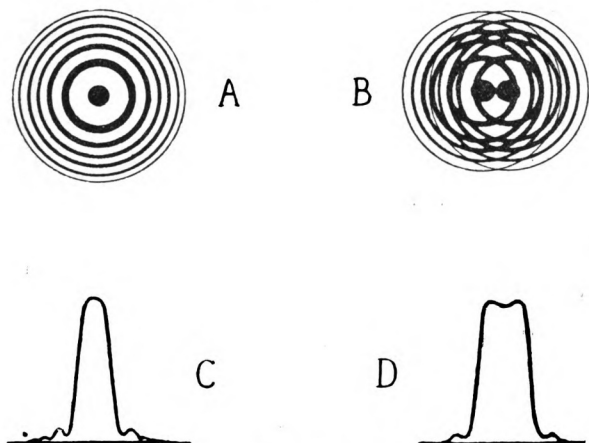


FIG. I.—STELLAR IMAGES IN THE TELESCOPE.

four times the amount of light to form the image. (2) It has twice the space-penetrating power, and therefore opens up eight times as great a volume of space to the observer. (3) It allows the use of almost double the magnifying power under favourable conditions. (4) It can resolve much closer double stars and reveal finer planetary and other detail.

It is interesting to note that the diffraction pattern of a star depends on the shape of the aperture of the telescope. If the aperture is made rectangular with its length horizontal, each component of a double star will be attended by a dark grating-like

pattern, as shown in Fig. II., the vertical lines being closer together than the horizontal. The resolving power is therefore greater in the horizontal direction, and hence the diaphragm should always be used with its length parallel to the line joining the two stars.

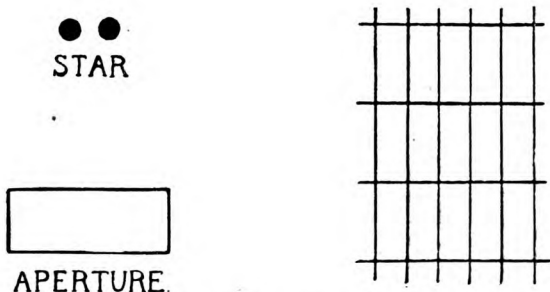


FIG. II.—USE OF A RECTANGULAR APERTURE.

[The lecture, which was illustrated by experiments and lantern slides, concluded with a discussion of telescope mountings, such as the altazimuth, the equatorial, and the coudé, and of the use of a fixed telescope in conjunction with a siderostat or coelostat. Views were shown of the largest reflectors and refractors now in use.]

Recent Advances in Cometary Investigation. By ADAM A. RANKIN, Secretary of the British Astronomical Association, West of Scotland Branch (a Communication from the Mathematical and Physical Section).

[Read before the Society, 12th January, 1910.]

IN the different phases of life the human mind is continually seeking changes of subject; there is a ceaseless activity towards something illimitable and changeable. It is not to be wondered at, then, that comets, frequently appearing suddenly in the nocturnal sky, having attached to them tails of immense size and brilliancy, exhibiting those phenomena so striking and wonderful in appearance, in motion, and in form, but above all, demonstrating those changing phenomena of nature which the human mind prefers, have attracted the attention of all since the very earliest ages of the history of the world.

Comets are only visible for a limited period; for after reaching perihelion (i.e. the nearest distance from the sun), and having moved round the sun, they disappear from view, after describing a longer or shorter path among the stars. To the naked eye they usually present the appearance of a misty star, followed by an almost invisible train of faint light. These two parts are termed the Head and the Tail. The head itself, however, has two subdivisions (1) a bright, central portion called the Nucleus, and (2) its surrounding stream of faint light—which may be either spherical or oval in shape—called the Coma or nebulosity, the essential part of a comet. The nucleus, commonly seen near perihelion, is star-like, and often consists of several portions; while the tail, when it is present, assumes the appearance of a stream of light flowing from the head and always turned away from the sun.

The telescope has done much to assist us in describing more fully this heavenly wanderer, for when first observed through it, although still very far away from the sun, a comet appears a small, insignificant, spherical body like a nebula, the bright, central portion being almost invisible. As it draws nearer the sun in its orbital motion the nucleus rapidly becomes more definite, and

luminous jets or envelopes are ejected from the side nearest the sun, while the tail now makes its appearance. These jets or streamers of light would seem to be expelled in layers, which rapidly extend outwards; but it sometimes happens that concentric envelopes instead of jets are emitted. After the comet has passed round the sun all the phenomena are reversed; the magnitude and brilliancy diminish, the jets and envelopes disappear, until at last it passes off into interstellar space as a mere misty disc or a patch of foggy light of irregular form.

But it is perhaps to spectroscopy even more than to photography that the more remarkable of the recent advances in astronomy are due. More than two hundred years ago Newton showed that when the light of the sun is passed through a triangular prism of glass it is not only refracted or changed in direction, but is split up into different colours, commonly known as "the colours of the rainbow." When this light, before entering the prism, comes from a narrow aperture, the colours after emergence from the prism are well separated and fairly distinct, and shade by insensible gradations from red, orange, and yellow, to green, blue, and violet. White light being made up of all these colours, which are differently altered in direction after emergence, the result is that the line of white light becomes a coloured band. To each special shade of light there corresponds a definite position in the spectrum. If we take the spectrum of sunlight we find that although it is *apparently* continuous, yet when carefully examined there are a number of more or less dark lines or narrow gaps in it. Hydrogen (an incandescent gas) under low pressure gives a spectrum, not continuous, but consisting of one or more of these bright lines with intervening dark spaces. It is a fundamental principle in physics that every gas, when cool, absorbs the same kind of radiation as it emits when incandescent; therefore by comparing the position of these dark lines of the spectrum with those of the bright lines, and by rendering incandescent some of the known elements, we can determine what substances are contained in the atmosphere which surrounds those bodies which are being examined.

Thus, comets give faint continuous spectra due probably to reflected sunlight, generally overlaid by three bright bands, the first in the yellow, the second in the green, and the third in the blue. Occasionally a fourth band in the violet is observed. As

this spectrum is so nearly like that given by the blue flame of a Bunsen burner consuming coal gas, it is generally known as the *Hydro-Carbon Spectrum*.

When a comet is approaching the sun, like Halley's at the present time, changes are continually taking place in the spectrum, for metallic lines, such as sodium and magnesium, are seen in addition to the hydro-carbon bands.

It should be noted, however, that though a comet gives a spectrum showing the presence of hydro-carbons, we must not suppose that these substances comprise the greater part of its mass. The gaseous portion is probably only a small percentage of the whole matter contained in it.

Let us now investigate how a body consisting of the materials to which we have just referred gives rise to the various phenomena which comets exhibit. There are three questions to answer in this connection :—

- (1) Where does the material forming a cometary tail originate?
- (2) Why is the tail always directed *away* from the sun?
- (3) Why are the tails of varied form ; some short and stubby, some plume-like, and others practically straight?

The first two questions being closely connected may be taken together. In 1872, Clerk Maxwell showed that a necessary consequence of his theory of the electro-magnetic origin of light was the existence of a *pressure due to light*. Many experiments had been made to investigate this pressure, but not only did they fail to indicate the amount of it, but they did not even show its existence. Recently, however, success was achieved, and the cause of the previous failure was simply due to the apparatus employed not being of anything like sufficient delicacy. Yet this pressure is not so small as to be negligible in astronomical problems ; and in a few—and especially the one under consideration—it is of transcendent importance.

Calculations show that the light of the sun impinges on the illuminated hemisphere of the earth, with a total thrust of 75,000 tons. To-day at noon the sunlight would have exerted a pressure of about four ounces on every acre of ground in this country. Small as these pressures are, they become of relatively great magnitude in certain cases. It is a well-known fact that a body having weight on the earth's surface is explained by saying that

the earth has an attraction for the body and pulls it towards its own centre. But this is only a particular case of a universal attraction which each body has for every other body in the universe. This Newton expressed in his famous Theory of Universal Gravitation, which says, that every particle of matter in the universe attracts every other particle with a force whose magnitude is directly as the product of their masses, and inversely as the square of their distances.

Let us therefore consider one of the particles, *A*, of a comet, and let us represent this gravitational attraction of the sun on this particular particle *A* by the number 8, and let us also represent the *repulsive* force of the sun, due to the pressure of its light, by the number 4. The gravitational force will depend upon the *mass* of the particles, or considering particles of the same material, upon their *volume*; while, on the other hand, the pressure of light will vary, not as the mass, but according to the frontage exposed to the light of the sun, that is, according to its *area*.

Therefore, if we take a particle *B*, exactly one-eighth of the size of *A*, we would then find that the gravitational force would be represented by $\sqrt[3]{8} = 2$, and the radiation pressure would be represented by $\sqrt{4} = 2$; which means that the particle would be in equilibrium between the gravitational force and the radiation pressure. If we go a step further and take a particle *C*, exactly one-eighth of the size of *B*, what do we find? The gravitational pull is now represented by $\sqrt[3]{2}$, which is almost 1.25, while the pressure of light is $\sqrt{2}$, which is approximately 1.4; that is, there is a force of about 1.5 repelling the body away from the sun.

By carrying on this progression *ad. inf.* we would find that the more we *diminished* the bodies in size, the greater became the radiation pressure compared with the gravitational pull; while on the other hand, the more we *increased* the size of the bodies the more would the gravitational force of the sun preponderate over the repulsive force of light. Accordingly we see that in the case of minute bodies, such as are present in comets, radiation pressure is comparable to gravity; and in the case of the ultra-microscopical particles forming the tail, we may almost neglect gravitation altogether in consequence of the relatively vast pressure of the incident light.

The theory, first enunciated by Clerk Maxwell, that light should exert a pressure upon any body on which it might fall, has recently

been verified by such noted physicists as Professors Nichols and Hull. From the principle—every action has an equal and opposite reaction—it is evident that a back pressure must be exerted upon any body which is giving out light or radiation of any kind. Prof. Poynting, in his preliminary communication to the British Association in July of last year at Winnipeg, described some first measurements made by himself of the pressure exerted. "It would not be convenient," he said, "to use an incandescent body for this purpose, owing to the disturbances that would arise. Instead, a thin slip of black or bright material is exposed to radiation, and its temperature rises until the loss by radiation is equal to that which it receives." A perfectly black material will suffer the pressure due to the incident radiation, *and that alone*—since it radiates equally on both sides. This pressure is equal to the density of the radiation, which he called E . A perfectly reflecting surface (such as silver approximates to) will experience a pressure equal to twice E , since the beam of radiation is reflected by it, and again there will be no other pressure in this case, because there is no rise in the temperature. But, if a metal film, blackened on one side, be taken with the black side towards the incident beam, there will be an extra pressure due to the inequality of the emission from the two sides.

Working upon these principles, Prof. Poynting discovered that his measurements agreed well with the expected results.

But the calculation made by Prof. Poynting, to which particular attention should be given, is this:—that a particle of the same density as the earth, and the $\frac{1}{100,000}$ th part of an inch in diameter, would, at the earth's distance from the sun, be in equilibrium between gravity and solar radiation pressure. Let us apply this result to the case of comets.

In Fig. 1, S represents the sun; E the earth's orbit round it; PQX , the parabolic path of a comet passing round the sun; and P , a particle of a comet situated at the intersection of these two orbits.

Let us consider this particle P of moderate size, much more than the $\frac{1}{100,000}$ th part of an inch in diameter. For such a particle, gravitation is enormously more potent than radiation pressure; therefore the particle will move in the parabolic path PQ under the solar attraction.

Another particle exactly the $\frac{1}{100,000}$ th part of an inch in

diameter will be in equilibrium, as the two forces exerted are equal in amount and opposite in direction ; it will therefore move in a path which keeps at about the same distance from the sun, namely the circular arc PR . A third particle of much smaller dimensions is influenced to a much greater degree by the repulsive action of the solar light than by the attraction due to gravity. The particle, accordingly, speeds in a path which carries it gradually to a greater distance from the sun, namely, PT . By applying this theory to the whole we would find that many of the particles of the comet, which were formerly collected at P , were now spread out into the curve QRT .

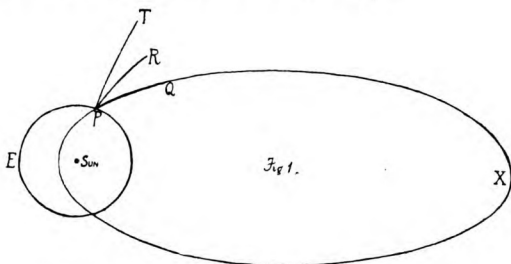


DIAGRAM TO SHOW FORMATION AND DIRECTION OF TAIL.

This, then, is the origin of cometary tails and the key to their direction. They are formed of particles, minute and for the most part ultra-microscopical, given off from the head, and driven away under the repulsion of the radiant waves of light and heat from the sun. These particles never return. The comet is being gradually dissipated, and the material is perhaps the great supply-fountain from which we derive those transient visitors to our atmosphere—the shooting stars.

Having thus answered the first two questions which were asked, viz. :—regarding the formation and direction of the tails, we have next to consider the third question—the varieties of cometary tails.

As the length and form of the tail will be dependent on the size and nature of the particles composing it, therefore, if the particles are *metallic*, the radiation pressure will be small in comparison with gravitation, say about $\frac{1}{3}$ th or $\frac{1}{10}$ th, and we shall have short, stubby tails like brushes. This type of tail is, however,

rare, and when occurring is usually present with a second tail of the next type. This variety consists chiefly of *hydro-carbons*; and the radiation pressure is at least twice as great as the gravitational pull; the tails are accordingly longer and plume-like. This is by far the commonest type of cometary tail.

A third type consists of *hydrogen*. Here the radiation pressure is very many times greater than the gravitational force, and the result is a long, thin, straight tail, directed almost exactly away from the sun. The two additional rays in Donati's Comet are perhaps the best examples of this type of Hydrogen tail.

There is an interesting point in connection with two of the short-period comets which has given rise to much discussion. These two particular comets have shown indications of a shortening of their period, an effect which one naturally attributes to the action of some retarding medium. The names of these two comets are Encke's and Brorsen's, both familiar to present day astronomers. In 1786, Encke's Comet had a period of $1212\frac{3}{4}$ days, while in 1858 it was only $1210\frac{1}{2}$ days, a decrease of $2\frac{1}{4}$ days in 72 years. With Brorsen's Comet, however, the alteration is much more marked, diminishing from 2034 days in 1846 to 1994 days in 1879, a difference of 40 days in 33 years.

The astronomer Encke (after whom the comet is named), discussed this question of the diminution of a cometary period, and he conceived the idea that interplanetary space was filled with a medium of such extreme tenuity, that while affecting bodies such as comets, it had no appreciable action on the massive planets.

Such a medium was at one time sought for in the luminiferous ether, but we now recognise in *solar radiation pressure* a more satisfactory solution of the anomalous motions of these comets.

Particles moving in orbits round the sun absorb the solar radiation energy incident upon them. Part of it is given out again, being radiated in all directions. This causes a minute resultant force, retarding the motion of the particles, which will accordingly move in a decreasing orbit, and will thus have a shorter period of revolution.

Biela's Comet occupies a unique position in the history of remarkable comets, for as a comet it has ceased to exist. It was discovered by an Austrian Major, of the name of Biela, in February, 1826, and calculations were at once made to find out its period, which was determined as being one of $6\frac{3}{4}$ years. Accord-

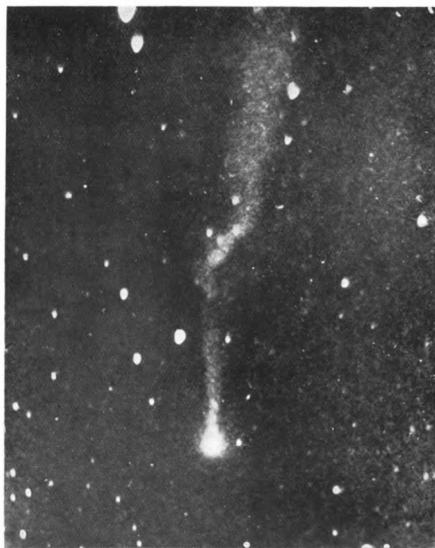
ingly, its nearest approach to the sun took place in November, 1832, only *one day* earlier than the time calculated, showing how the theory of cometary orbits, based on the principle of universal gravitation, was being perfected. At this appearance in 1832, Biela's Comet excited the fears of the people, for it was supposed to come into collision with the earth. Their fears, however, were unfounded, as neither the earth nor Biela's Comet were any the worse of the supposed collision. The comet appeared again in 1839; but at its next return in 1845, it was divided into two parts. These two comets pursued the same orbit, but when they appeared again in 1852, they were more than a million miles apart. They should have been observed again in 1866, but notwithstanding diligent search for them by powerful modern instruments, and although their orbit intersects that of the earth near the point occupied by our world in September, neither of them, as comets, has ever appeared since. But in November, 1872, when the earth was again passing this intersecting point of the orbit of the lost comet, a most brilliant shower of meteors or falling stars was observed raining down at the rate of thousands per hour. As this same brilliant meteoric display took place again in November, 1885, and, as on both occasions, the radiating point was in the constellation Andromeda, they have been called *Andromede Meteors*. The direction from which these *Andromedes* came is similar to that of Biela's Comet, while the times at which they appear occur precisely at the time when the comet should have appeared; are we not then justified in assuming that these falling stars are the products of the disintegration of the lost comet, and in regarding their orbits as being the same?

This connection between comets and meteors has been found to apply to other cases. In all, four comets have orbits that are identical with four meteoric swarms, these are:—

- (1) Tempel's (No. I.) Comet of 1861 and the April (Lyrid) meteors;
- (2) Comet III. of 1862 and the Perseids or August shower;
- (3) Tempel's (No. II.) Comet of 1866 and the November or Leonid meteors;

and lastly, Biela's Comet is identical with the November or *Andromede* star-shower.

PLATE II.



Comet Morehouse on 15th October, 1908. Sharp curvature in tail shown. Photographed by Mr F. W. Longbottom, F.R.A.S., with 9-in reflector : 5 minutes' exposure.

This disruption of cometary material formed the basis of a theory which Sir Robert Ball enunciated regarding the peculiar twistings or bends which appeared in the tail of Swift's Comet on 7th April, 1892. Beginning near the nucleus, the cometary matter shot off at a fairly large angle, and after continuing in this direction turned quickly and pursued a new course parallel to the proper direction of the tail. It was observed that at the bend the tail appeared much brighter than the parts surrounding it, just as if the cometary matter became piled-up in its attempt to pass round the curve. Sir Robert Ball maintained that Swift's Comet displayed the actual formation of a second comet as a part of the first, and that it could hardly be doubted that this second comet was destined to assume an independent existence. This hypothesis was disproved, however, by four photographs¹ which were taken about two months afterwards, and which gave no indication of the disruption of the material forming the tail in the aforementioned manner.

Additional proof of the inaccuracy of this hypothesis was given by photographs taken of Comet Morehouse, the discovery of which took place in September, 1908. On the night of 3rd October, the main tail disappeared; but as the tail may be likened to the steam which comes from a locomotive, and is constantly being dissipated and renewed, this disappearance merely meant a temporary lull in the ejection process from the head of the comet. Between October 3rd and 12th, peculiar twistings of the different streamers forming the tail were observed, and on 15th October, a sharp curvature in the tail was discerned, exhibiting the same phenomena as Swift's Comet did on 7th April, 1892. Recollecting what has been already said regarding the particles driven off from the head into the tail under the repulsion of the radiant waves of light from the sun being for the most part ultra-microscopical, it is difficult to understand how such tiny particles have the potentiality of forming a new comet. Perhaps a more acceptable hypothesis is to regard the tail as having been shattered by some kind of resisting medium, and the particles composing the tail to have given out part of the solar radiation energy absorbed by them, thus causing a minute resultant force which would retard their motion and produce a temporary deviation in the direction of the particles.

There is an interesting circumstance brought out very clearly by

These photographs were exhibited at the lecture.

the photographs which were taken of Comet Morehouse when we remember that the stars form a background with respect to the comet. It was observed that many of the stars were visible right through the tail. To appreciate all that this implies, we should note that many of the stars in the photographs were totally invisible to the naked eye ; yet they were distinctly seen, notwithstanding the interposition of this stupendous volume of cometary matter, thus demonstrating the extreme tenuity of the material of which it is composed.

The comet whose exact period of revolution was first discovered was Halley's, and because of the great interest it is arousing at present, and will arouse in the near future, a short account of its history may be opportune.

The astronomer Halley published his catalogue of comets in 1705, enumerating the then known details of twenty-four comets. On examining their elements he observed that the comets of 1531, 1607 and 1682 had orbits which were all the same. He therefore suspected that these three comets were, in reality, the same object, so he announced the next return of the comet for 1758. As time went on Halley seemed to grow more decided in the matter, for in his *Astronomical Tables* he wrote :—" You see an agreement of all the elements in these three comets which would be next to a miracle if they were all different. . . . Wherefore, if according to what we have already said, it should return again in 1758, candid posterity will not refuse to acknowledge that this was first discovered by an Englishman." But posterity and science have not forgotten his claim, for they have given his name to the comet, whose periodic return, announced beforehand, was confirmed by the event. At the same time we should not fail to recognize the claims of two of his closest friends, Clairaut and Lalande, who calculated the exact amount of retardation which the comet would undergo in its long voyage through space. As we can readily understand this was a work of immense difficulty, and Clairaut and Lalande were modest enough to make reservations, for they recognized the fact that many unknown causes of perturbations might arise, and errors might have been committed in such intricate calculations. Therefore, when their combined efforts brought forth the remarkable conclusion that the comet would not reappear in 1757—as predicted by the many savants of the time—nor yet in 1758, but early in April, 1759, they asked for a month's grace.

PLATE III.



Comet Morehouse, taken on 19th November, 1908, at the Royal Observatory,
Greenwich, with the 30-in. reflector : 25 minutes' exposure.

The comet was seen near Dresden on the 25th December, 1758 (the year predicted by Halley himself), and observations were soon made of it, with the result that its perihelion passage would take place on 13th March, 1759, exactly thirty-two days before the time calculated by Clairaut and Lalande.

Another return of Halley's comet took place in 1835. This reappearance furnished an opportunity of testing the progress made by theoretical astronomy during the period occupied by the comet in making its revolution. Among the unknown causes which Clairaut could not take into account, was the Planet Uranus, discovered by Sir John Herschel in 1781. According to calculations the comet should have passed perihelion on 13th November, 1835. On 5th August it was observed at Rome, and the exact date of its perihelion passage was 16th November, being less than *three days* between the calculated and the observed times.

But still greater achievements in astronomical research were shown at its reappearance in September, 1909. It was generally expected that the comet would have been discovered in the spring of 1909, but when that period passed and no trace of it had been discovered, it was then determined that no further opportunity of observing it would present itself until the beginning of the autumn. Accordingly, it was suggested at the Royal Observatory, at Greenwich, that 10th September was the first possible date upon which they should take photographs of the comet. On the previous night—9th September—the assistant-in-charge at Greenwich took short trial exposures on the place where the comet was computed to be. As the plates were badly blurred by the moon's light they were not carefully examined. The next two evenings—10th and 11th September—were overcast at Greenwich, but different weather conditions prevailed at Heidelberg, for, an hour-and-a-half after midnight on 11th September, Professor Max Wolf photographed the comet. When this discovery became known the two experimental Greenwich photographs, taken on the 9th, were carefully examined, and the tiny, faint object was found on them. From this we see how keen was the struggle for astronomical honours, which fell to Germany under these unfortunate circumstances. It is extremely satisfactory to learn, however, that the comet was found in very close proximity to the place predicted in the ephemeris computed by Messrs Cowell and Crommelin, of Greenwich Observatory, as shown by the following figures :—

	Right Ascension.	Declination.
The Position at 14 ^h . 7 ^m . 3 ^s . (Heidelberg) Mean Time, - - - - - }	6h. 18m. 12 ^s .	+ 17° 11'
The time computed from the ephemeris of Messrs Cowell & Crommelin, - }	6h. 18m. 4 ^s .	+ 17° 6'

This was a veritable triumph for mathematical astronomy, especially when we remember the insufficient data from which the calculations were made and the amount of the perturbations, incident to the journey of the comet, caused by the discovery of the planet Neptune in 1846.

From subsequent photographs taken at Heidelberg, Greenwich, Lick and Yerkes' Observatories, a corrected ephemeris was obtained giving the date of the perihelion passage of the comet as 20th April, 1910. An examination of these photographs¹ shows that although Halley's Comet is approaching the sun at nearly two million miles a day, and is rapidly becoming brighter, that increase of brightness is fluctuating, as will be seen from the following table of the estimated brightness of the comet taken at different times since its rediscovery :—

TABLE TO SHOW THE FLUCTUATIONS IN THE MAGNITUDE OF
HALLEY'S COMET.

Date.	Estimated Magnitude.	Date.	Estimated Magnitude.
Sept. 9	16 [·]	Nov. 22	10 [·]
Sept. 11	16 [·]	Nov. 30	11 [·] 5
Oct. 15	14 [·] 5	Dec. 1	12 [·]
Oct. 25	14 [·] 5	Dec. 3	12 [·]
Nov. 1	14 [·]	Dec. 4	10 [·] 5
Nov. 9	13 [·] 3	Dec. 16	11 [·] 9
Nov. 16	13 [·] 2	Dec. 26	11 [·] 7
Nov. 21	12 [·]	Dec. 31	11 [·] 4

¹ The four photographs taken at the Yerkes' Observatory, and the two taken at Greenwich, were exhibited at the meeting.

The position of the comet when discovered was on the borders of Gemini and Orion. During the months of October and November it passed across the small portion of Orion which lies between Gemini and Taurus, and was close to Aldebaran on 1st December. Five days later it had passed through the Hyades, and by the middle of December had entered the constellation Aries. On 12th January it was immediately to the south of Aries, and this westward movement will be continued until it has passed through the northern limits of Cetus and reached the borders of the constellation Pisces on 20th April, the date of its nearest approach to the sun. Thereafter the comet will pursue an easterly course, and will appear to move more quickly than at any former part of its journey. By 13th May it will be in almost the same position (to the south of Aries) as it was on the night of 12th January, and four days later—17th May—will repass Aldebaran. It will finally pass off into interstellar space about 23rd June, to the south of the constellation of Leo.

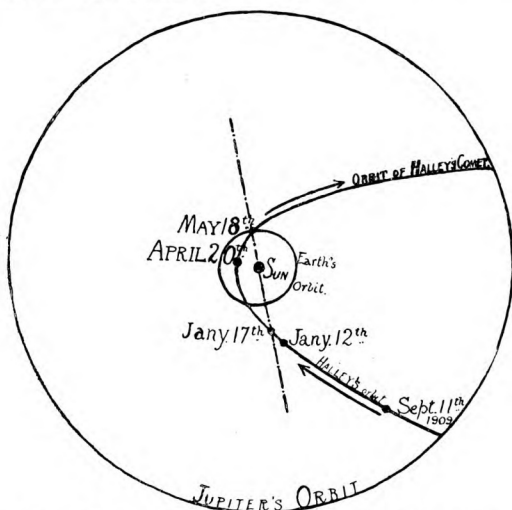


Fig. 2. DIAGRAM SHOWING ORBIT OF HALLEY'S COMET INSIDE THAT OF JUPITER.

In Fig. 2, the orbit of Halley's Comet is shown inside the orbit of the giant planet of our solar system Jupiter, and indicates the position of the comet in its orbit when first discovered on the morning of 11th September. The dotted line indicates the line of nodes, and it will be observed that on the evening of 12th January, Halley's comet had almost reached the ascending node—which it was calculated to pass on 17th January—and its position then showed how much it had advanced in its orbital motion sunwards. From 17th January until 18th May—the date of the descending node—the comet will be above the plane of the ecliptic, and for seventy-eight days will be inside the earth's orbit, being at unit distance from the sun—11th March and 28th May.

At the descending node, the comet's orbit will be about fifteen million miles within that of the earth, so that matter repelled by the sun from the comet's nucleus, in order to meet the earth when crossing the comet's orbit plane, will have to attain a velocity of over 250,000 miles an hour. The orbits of the comet and the earth approach each other within seven million miles at the point which the earth reaches on 8th May and the comet about the 26th of May, so that meteors, if any, cast off by Halley's Comet, will be most likely to be seen within a few days of the 8th of May.

We should have Halley's Comet for about three hours after sunset about the end of February and the first few days of March ; but after the first week of March it will be lost in the rays of the sun till nearly the end of April, when it will be seen for some time before sunrise. By the middle of May it will have passed out of the vision of observers in the northern hemisphere, and thereafter, until it becomes lost in the depths of space, it will be visible only to observers in the southern hemisphere.

On the morning of 19th May, the date when the comet traverses the sun's disc, an interesting event will happen ; for then the orbit of the earth and that of the comet will have intersected. One noted French astronomer maintains that we shall all be suffocated by the poisonous gases of which the tail is known to be composed. It is certain that already on many occasions some of the attenuated vapour in the tails of comets, must have come within the earth's attraction, and consequently must have been absorbed in our atmosphere, yet our terrestrial globe has shown no visible alteration.

If it should happen that on this occasion the expanse of the comet's tail should speed towards the earth at a quarter of a million miles an hour, and so cause its constituent particles to enter our atmosphere, the moment these minute bodies came into it they would brighten and glow with the friction; therefore, those interested persons who care to look out a few hours before sunrise, on 19th May, will behold nothing more disastrous and frightful than a magnificent auroral display.

[The Lecture was illustrated by photographs (taken at the Royal Observatory, Greenwich, at Heidelberg, Yerkes, and Lick Observatories) of the following comets: — Swift's, Brook's, Rordame's, Daniel's, Morehouse's, and several of Halley's since its reappearance in September, kindly lent by Mr A. C. D. Crommelin of Greenwich, and by diagrams showing the position of Halley's Comet among the stars from 12th September, 1909, till 23rd June, 1910, and the relation of the comet's orbit to that of the earth.]

HALLEY'S COMET.

[Notes added on 5th February, 1910. Halley's Comet during the month of January was still very faint, its apparent star magnitude only increasing from 9.5 (on New Year's Day) to 8.5 on 31st January, 1910, and on certain occasions during the month was scarcely perceptible.]

THE 1910 (A) COMET.

[During the time occupied in revising the foregoing abstract for the *Proceedings*, a brilliant comet was discovered by the astronomers Worsell and Innes on 15th January in the Orange River Colony. Within forty-eight hours after its discovery, it had increased in brilliancy to such an extent that it was easily discernible with the naked eye from all parts of the world. A circular issued from the Kiel Observatory on 31st January contained the following information:—

Time of perihelion passage—17th January, 1910.

Longitude of ascending node, - - - $83^{\circ} 59'$

Inclination of the plane of its orbit, - - - $138^{\circ} 25'$

Perihelion distance—0.109 of the earth's mean distance from the sun.

With the exception of four evenings, when the horizon was

enveloped in banks of cloud, excellent atmospheric conditions prevailed in the West of Scotland from the 16th to the 29th January, and doubtless many thousands of observers were enabled to see the great comet over the western horizon after sunset.

Its greatest brilliancy was attained on 17th January, and during the time it was visible that evening, it presented a magnificent spectacle, the brightest portion almost equalling the splendour of Venus, to which planet the comet was then closely positioned.

From a well-defined nucleus in the constellation Aquarius, the the tail of the comet extended vertically upwards, widening and curving gradually in a southerly direction. With optical assistance, the head formed two streamers of light, which were separated from each other by a dark band; and the tail, presenting an arched, hollow cone of 25° in length, was similar in general appearance to drawings of Donati's comet of 1858.

The nucleus, as seen through a binocular on 25th January, was faint, while from the 26th to the 28th of January, owing to the atmospheric conditions, it was not easily visible—although it was horizontally on a line with Venus—but the tail could be traced, extending for about 20° above it.

On the evening of 29th January, a perceptible change had taken place in its appearance, for the coma, although almost as broad as the moon's apparent diameter, was very much fainter than it was on 25th January, testifying to the diminution of the repulsive force of the sun; but the tail was still traceable to the southern stars of Pegasus. It is now rapidly diminishing in brilliancy, and in a few days will be lost in the depths of space, possibly never to return.]

The Rise and Development of Scottish Education. By JOHN CLARK, M.A., Honorary Secretary, Historical and Philological Section (being a Contribution from the Historical and Philological Section).

[Read before the Society, 15th December, 1909.]

To outline the story of Scottish Education within the compass of a single paper means to leave much unsaid. It further implies great difficulty in the choice of materials and the certainty of presenting at best an imperfect picture. With a clear appreciation of all this, we wish to direct your attention mainly to the expansion of the school system of Scotland, primary and secondary. Other matters of vital moment, such as the university movement, the Training of Teachers, and the work of Continuation Classes and Central Institutions, are introduced only in so far as they are necessary to the understanding of our main line of discussion. Similarly, questions of administration are dealt with as briefly as possible. We are concerned with the product rather than the machinery, which nowadays has become so complex that it sometimes causes us to lose sight of education altogether. Besides, the administrative machinery may be perfect and the education which is its result may be utterly lacking both in vitality and inspiration. An attempt has been made, however, to give some idea of the great world-movements that have influenced Scottish thought as evidenced in Scottish Education, firstly as a function of the Church, and secondly as a function of the State.

We find four main stages of development in Scottish Education. The first extends to the Reformation; the second has its conclusion in the Education Act of 1872; the third takes us to 1892 when the co-ordination of primary and secondary education became the leading problem; the fourth culminates in the system of to-day.

Of what Scottish Education was in the first gray dawn of history, no record remains, but we may take it that the primitive education of the child, schooled by nature to be a useful unit of the tribe,

did not differ materially from that of other barbarian peoples. With the advent of Agricola (80 A.D.) the ancient Briton came into direct contact with Roman civilisation. From that date we have some record, at first scanty, casual and intermittent, of the forces that came to mould the character of our people, and of the impress made on their education and their life. The system of education underlying this civilisation had grown out of the work of Plato, supplemented by that of Aristotle, and consisted of grammar, rhetoric, dialectic, arithmetic, geometry, astronomy (or rather astrology) and music.¹ It is interesting to note, with regard to this education, that Tacitus was already lamenting its growing artificiality and formalism and deprecating the dangerous tendency to divorce instruction from practice.² Of the labours of the first Christian missionaries, whom tradition refers to the closing years of the Roman occupation, even legend has little to tell, but we know that the Rome from which, e.g., Ninian came had discarded what was best in the old pagan literature and education, and had sacrificed the intellectual to the ecclesiastical. The popular leaders of the Church had condemned everything that savoured of heathen wisdom and eloquence, and were resisting all attempts to produce "a mottled Christianity of Stoic, Platonic and dialectic composition."³

This was the position when, in 563, Columba settled in Iona. That year is commonly accepted as the real beginning of Scottish Education, in so far, at all events, as education implies consciously directed moral and intellectual influence. From this standpoint the Church was the founder of the schools of Scotland, and for long it held in its hands their administration, management and control. The function of the State as the administrator and conservator of education was of distinctly later growth. We have little information as to the schools whose foundation arose directly from the influence of St. Columba, but it is clear that the confusion consequent on the invasion of the Northman, the growing tendency towards monasticism and asceticism in religion, and the absence of a territorial system militated against his efforts to organise and

¹ This course from the fifth century onwards was known as the Trivium and Quadrivium.

² Cf. *Dialogus de Oratoribus*, esp. Chaps. 31, 35.

³ Tertullian, *De Præscriptione Hæreticorum*, Chap. vii.

consolidate education.¹ His aim was moral rather than intellectual. The subjects of instruction were reading, writing and labour, i.e., agriculture.² Reading involved a knowledge of Latin and probably Greek.³ The memorising of the psalms was also an important part of the curriculum.⁴ Writing consisted mainly of transcription. Great care was bestowed upon the work, and the scribe was held in high esteem.⁵

It is not without significance that the year which witnessed the death of St. Columba also beheld the arrival of St. Augustine, and it is matter of common knowledge how, after the Synod of Whitby (664), the Scottish people were brought more and more in touch with European civilisation and culture. From this period to the reign of David I. (1124-1153) we have little information. It is only by a knowledge of what was taking place on the continent of Europe that we can in any way penetrate the darkness which for three hundred years followed the death of Bede. The Carolingian Revival (c. 787) had initiated reforms in the continental schools in a laudable attempt to stem the tide of ignorance and barbarism,⁶ but for two hundred and fifty years little progress was made. Great political and social crises retarded the advances of education. The Frankish empire itself was in the throes of dissolution. The Northmen were invading Central Europe. The Danes were pouring into England. The Saracen was threatening to overwhelm the whole of Christendom. Yet this proved but the darkest hour before the dawn. Henceforth the moribund western thought was brought in contact with the intellectual activity of the Arabs in the east and in the south. From Bagdad, the capital of letters and of science, learning was carried westwards with the sword and with the Koran. The ancient storehouses of literature were opened. The slumbering intellect of Europe was once again awakened. The schoolmen, despite their disputations about trifles, dragged

¹ Cf. Edgar, *History of Early Scottish Education*, p. 16; Adamnan, *Life of St. Columba* (Bannatyne Club), pp. 368-9; *Book of Deer*, pref. pp. 105-9; M'Intosh, *History of Civilisation in Scotland*, Vol. i., p. 185.

² Cf. Adamnan, *Life of St. Columba* (Bannatyne Club), p. 9.

³ Cf. Mackinnon, *Culture in Early Scotland*, p. 167.

⁴ Cf. Bede, *Ecclesiastical History*, Bk. iii., c. 5.

⁵ Adamnan, *Life of St. Columba* (Bannatyne Club), pp. 353, 365.

⁶ Cf. Mullinger, *Schools of Charles the Great*, pp. 97 ff.

forth the purely intellectual from the darkness into which it had been thrust by the monastic tendencies of the early middle ages, and by the introduction of that scientific terminology which is essential for accurate thinking, they did much for the subsequent development of thought.

Yet amid this latent intellectual activity the progress of education was but slow, and in Scotland, even by the eleventh century, its day is hardly breaking. What education there was bears everywhere the impress of the monk. The curriculum was dominated by its usefulness for the church services. Nominally it embraced the Trivium and Quadrivium; in reality it offered only the merest elements of Latin, music and arithmetic. The lay population had little or no education, and the nobles and barons despised it. The records of the twelfth century supply more evidence of intellectual life. Henceforth we find many references to schools and their connection with the Church. Notable examples are St. Andrews¹ (c. 1120), Perth² (c. 1150), Stirling² (c. 1150), and Linlithgow³ (c. 1187. By this century the parish had definitely emerged,⁴ and it was possible to organise education with the parish as the unit through the medium of the parochial school. This is important. We often lose sight of the fact that, four centuries before the Reformation, there existed in Scotland a national system of education associated with the parish church. That these early schools did not accomplish more may be due to the fact that the influence of the parish was over-ruled by that of the cathedral or the abbey. The great monasteries and abbeys not only had schools within their walls, but also extended their patronage and control to many schools outside and even at considerable distance.⁵

Three types of school, in addition to the parish school, grew out of the Catholic territorial system—the Cathedral School under the

¹ *Eadmeri Historia*, ed. Rule, p. 283.

² "Ecclesiam de Perth et illam de Striuelin et scolae et cetera omnia ad eas pertinentia," *Registrum de Dunfermelyn*, No. 92, p. 56.

³ "Ecclesiam de linlidu . . . et schola eiusdem loci," *Registrum Prioratus Sancti Andree*, p. 63, Fol. 28a.

⁴ *Cf. Book of Deer*, p. cxxxiii, *Origines Parochiales Scotiae*, Vol. i., pp. xxvii-xxviii.

⁵ *Cf. Liber S. Marie de Calchou* (Bannatyne Club), Vol. i., p. 5.

direct rule of the Chancellor,¹ the Collegiate School dating back to the latter part of the reign of David II. (1329-1371)² and the Sang School whose object was to train boys for the musical services of the Church. The Sang School originated about the middle of the thirteenth century.³ This school, unlike the Song School in England,⁴ does not appear to have given instruction in reading or writing. These subjects were at a later date (c. 1499) supplied by the Lecture School⁵ which flourished side by side with the Sang School. These schools, with the Burgh or Grammar Schools, of which the Cathedral and Collegiate School formed the nucleus, and the university, completed the educational machinery of Scotland.

Of the product of this machinery up to the fifteenth century there is little to say. In the twelfth century it is no doubt true of David I., that :—

“He illumynit in his dais
His landis with kirkis and abbais.”⁶

But even in his reign we find no literature and, outside the church, no lettered class.⁷ So far there had been neither prosperity nor leisure nor even peace. In the thirteenth and fourteenth centuries, educational progress was not possible. The whole physical and intellectual energies of Scotland, and all the moral stamina of the Scottish people, were being too severely strained in the great struggle they were making for their very existence, and it says much for them that they emerged from the conflict still a nation. In these years, however, we begin to hear of the Scot abroad—of men such as Michael Scott (1214-1300) and John Duns Scotus (1264-1308). To this period also the first authentic Scottish writers, John Barbour (c. 1316-1395) and Andrew of Wyntoun (died after 1420), must be referred.

¹ Cf. e.g., *Registrum Episcopatus Glasguensis*, I. 170.

² Lee, *History of the Church of Scotland*, Vol. i., pp. 47-49.

³ Cf. *Registrum Episcopatus Aberdonensis* (Spalding Club), Vol. ii., p. 49.

⁴ Cf. Foster Watson, *The English Grammar Schools*, pp. 145-6.

⁵ Cf. Grant, *History of the Burgh Schools of Scotland*, p. 63.

⁶ Wyntoun, *Original Chronicle*, Ch. cxxviii., Fol. 250b, Wemyss MS., S.T.S., Vol. iv., ed. Amours.

⁷ Cf. Hume Brown, *History of Scotland*, Vol. i., p. 96.

The fifteenth century is the line of cleavage between mediæval and modern. The process of transition was slow, and the precise date of its accomplishment is difficult to determine. Gradually, even as the sun rises in this northern clime, did the Renaissance morn appear. Its two great achievements were the discovery of the world and the discovery of man.¹ It was an attempt to set up a new standard of life and to prepare man for it by his education. It aimed at far more than the re-establishment of the life and ideals of the ancients. It concerned itself with all the activities and pursuits proper to mankind. It was the sixteenth century before, in any real sense, the influence of this movement came to be felt in Scotland. Still, before the fifteenth century closed, three Universities were founded, St. Andrews (1413/4), Glasgow (1453), and Aberdeen (1494). These Universities grew out of the educational needs of the people, for university education had meant for the Scottish student expatriation, danger, hardship. Unpopular at Oxford, he had usually betaken himself to Paris or Bologna. Speaking generally of the three Scottish Universities, we may say that their growth, prior to the Reformation, was hindered by the poverty, turbulence and savagery of the times, and by the selfishness and rudeness of the nobility and the upper classes. Besides, the feeling of unrest which was the precursor of the Reformation movement, and the absence of vigorous intellectual life within the universities themselves, militated against their expansion.

The university movement, however, was not the only sign of educational progress. For further evidence that Scotland was in living contact with the advancing thought of Europe which marked the advent of the Renaissance, we have but to look at the works of Robert Henryson (ob. c. 1490) in the latter part of the century, and for proof of the fact that Scotland was keenly alive to her educational needs we have but to turn to that remarkable specimen of far-sighted wisdom in reference to education—the Education Act of 1496, which established a system of compulsory education for the eldest sons of barons and freeholders, and marks the absolute beginning of compulsory education under the direction of the State.

The text of the Act runs thus :—

¹ Cf. Michelet, *Histoire de France*, Vol. vii., Introd. p. ii.

“It is statute and ordanit throw all the Realme that all barronis and frehaldaris that ar of substance, put thair eldest sonnys and airis to the sculis, fra thai be aucht or nyne yeiris of age, and till remane at the grammer sculis quhill thai be competentlie foundit and haue perfite latyne. And thereftir to remane thre yeiris at the sculis of art and Jure, sua that thai may haue knowlege and vnderstanding of the lawis. Throw the quhillis Justice may reigne vniuersalie throw all the realme. Sua that thai that ar Shereffis or Jugeis Ordinaris vnder the kingis hienes, may haue knowlege to do Justice that the pure pepill suld haue na neid to seik our souerane lordis principale auditour for ilk small Iniure. And quhat baroun or frehaldar of substance, that haldis nocht his son at the sculis, as said is, haifand na lauchfull essonye, bot failyeis heirin, fra knowlege may be gottin thair of, he sall pay to the king the soun of xx. 11.” (*i.e.* pounds.)¹

With the beginning of the sixteenth century the introduction of printing (1507) marked another forward step, but the great educational landmark of the century is to be found in the *First Book of Discipline* (1560/1). Before dealing with the details of that scheme we may for a moment refer to two companion pictures, the one of a parish the other of a grammar school, which show clearly the position of education in Scotland as regards school studies and curricula at the Reformation. The first is from the *Diary* of James Melville (1556-1614) under the date 1561-8, where he describes his own early education at the parish school at Logie, near Montrose, under Mr Wilyam Gray, the minister of the parish, where the pupils were “weill treaned upe bathe in letters, godliness, and exercise of honest geams.” The details of instruction may be given in Melville’s own words:—“Ther we lerned to reid the Catechisms, prayers, and scripture, to rehers the Catechisms and prayers par ceur, also nottes of Scripture efter the reiding thereof. We lerned ther the Rudiments of the Latin grammair, with the vocables in Latin and Frenche, also divers speitches in Frenche, with the reiding and right pronounciation of that tounge. We proceidit fordar to the Etymologie of Lilius, and his Syntax, as also a lytle of the Syntax of Linacer; therewith was ioyned

¹ *Acts of Parliament (Scotland)*, Vol. ii., p. 238.

Hunters Nomenclatura, the Minora Colloquia of Erasmus, and sum of the Eclogs of Virgill and Epist. of Horace; also Cicero his epistles ad Terentiam." He then goes on to tell us that the teaching was excellent, but that he himself learned more by memory than understanding. On the physical side the pupils were taught "to handle the bow for archerie, the glub for goff, the batons for fencing; also to rin, to loope, to swoum, to warsell, to prove pratteiks, euerie ane haiffing his matche and andagonist,"¹ both in lessons and play.

The second picture is from the Rules and Regulations of the Grammar School of Aberdeen, which enter minutely into the details of school life. Work went on from seven in the morning to six at night, with an interval for breakfast from about nine to ten and for dinner from twelve to two. The headmaster taught the highest class, but also took from time to time such of the other classes as he saw fit. He lectured daily on Terence, Virgil, or Cicero. At four o'clock the boys went over to their tutors the task of the day; from five to six came the evening disputations. The work began and ended with religious exercises. A Pythagorean silence for one year was imposed upon beginners. The table of confession had to be learned by heart, and a fair knowledge of elementary arithmetic was demanded. The pupils had to speak in Latin, Greek, Hebrew, French or Gaelic (Hybernice), and never in the vernacular, with those at any rate who knew Latin. Each pupil carried his own rod, and judging from the long list of offences which were visited by corporal punishment it must have been freely used upon him. Laws against bartering, gambling, etc., are detailed, and appended to the rules of conduct, which were printed to prevent the excuse of ignorance, are three sets of quotations from (a) Quintilian (b) Cicero, and (c) Terence, dealing with the duties of scholars, the whole ending with the motto:—*Hoc fac et vives*.²

This brings us to the first great educational scheme of the Reformers as set forth in the *First Book of Discipline* (1560/1). This was an attempt to establish anew, on a parochial basis, a national system of education. Its three notable provisions were:—

¹ *The Diary of Mr James Melvill, 1556-1601* (Bannatyne Club), pp. 13 ff.

² *Statuta et Leges Ludi Literarii Grammaticorum Aberdonensium*, from the *Miscellany of the Spalding Club*, Vol. v., pp. 399-402.

(1) That in sparsely-populated country districts, the "Upaland whaire the people convene to doctrine bot once in the weeke,¹ the minister should be responsible for instructing the young in the rudiments of education, and especialle in the Catechisme, as we have it now translaited in the Booke of our Common Ordour, called the Order of Geneva."² (2) That every church in towns of any reputation should have a schoolmaster able to teach grammar and the Latin tongue.² (3) That every "notable toun," and especially the "toun of the superintendent"² (i.e. in the ten seats of the Protestant Bishops, viz. :—"Kirkwall, Channonrie of Ross, Argyle, Auld Abirdene, Brechin, Sanctandrois, Edinburgh, Jedburgh, Glasgow, Drumfreise") should have a college "in which the Artis, at least Logick and Rhetorick togidder with the Tongues, be read be sufficient Maisteris for whome honest stipendis must be appointed."² Provision was also to be made "for those that be poore, and be nocht able by them selfis nor by their freindis, to be sustened at letteris, especiallie suche as come from Land wart."²

From these "colledges" the lad was to proceed to the university, but only on the production of a certificate from the "Maistre of the Schole" and the minister bearing satisfactory testimony as to his "learnynge, docilitie, aige, and parentage."³ The university scheme may be best illustrated from St. Andrews with its three colleges.⁴ The first college provided a three years' course in Arts; in the first year, Dialectic was studied; in the second, Mathematics; in the third, Natural Philosophy. Thereafter the student by examination could graduate in Philosophy. The college also provided a five years' course in Medicine following the preliminary course, though there appears to be some doubt whether these five years do not *include* the three years of the preliminary philosophy course.⁵ The second college provided a four years' course in Law. Here also the Divinity student

¹ *Works of John Knox*, ed. Laing, Vol. ii., p. 209.

² *Ibid.*, p. 210.

³ *Ibid.*, p. 214.

⁴ *Ibid.*, pp. 213-216.

⁵ Hume Brown takes this view, *Life of John Knox*, Vol. ii., p. 138 :—"If his choice were medicine he remained in the first college, and after a curriculum of two years was in a position to take his diploma as a practitioner of physic."

studied Moral Philosophy. He then proceeded to the third college, when he spent a year in the study of Greek and Hebrew, and five subsequent years in the study of the Old and the New Testament. Students of Law and of Divinity had to take the philosophy course before entering upon their special studies. It will be seen that the scheme of the Reformers is almost purely mediæval. It is not distinguished by much originality. Its merit lies rather in the comprehensive nature of its organisation and in its national character. Still, had their ideas been carried out, the hands of the clock would have been turned forward three hundred years. As it was, they did enough to put Scotland in the van of educational progress despite troublous times and opposition in high quarters. To appreciate this we have but to look to the work which Andrew Melville did in Glasgow University, where he was appointed Principal in 1574,¹ and if we desire to see how great that work was we have but to compare it with what was being done in St. Andrews.²

Another outcome of the educational movement of the reformers was the foundation of the University of Edinburgh, 1582/3. The absolute beginnings of technical education in Scotland are also to be referred to the sixteenth century,³ though the first attempt to establish technical schools is to be found in a resolution in the Minutes of Parliament of September, 1641.

The rest of Scottish Education prior to 1872 may best be summed up in a short study of the Parochial System (including the Burgh or Grammar School). It should be observed that the central idea of the reformed scheme was the retention and expansion of the parochial system which in germ had existed since the beginnings of Roman Christianity in Scotland. This system is the crux of the whole position of Scotland in the province of education. Not to understand it is to have no real conception of the meaning of Scottish Education.

We have seen that the catholic church had authority over the teachers, and demanded, as a pre-requisite of their being allowed to teach, that they should be licensed by the Chancellor. With the Reformation this hold over the schools was maintained. But

¹ *Diary of Mr James Melville* (Bannatyne Club), pp. 38, 39.

² *Ibid.*, p. 24.

³ Cf. Edgar, *History of Early Scottish Education*, p. 326.

the patrimony of the ancient catholic church had been seized by the nobles, and, therefore, from 1561 onwards, we find repeated appeals to Parliament that the nobles should be dispossessed and the money applied in large measure to the support of the schools. Regent Murray would have listened, but the nobles generally were too strong and education gained nothing from the confiscation. With the establishment of the reformed religion in 1576, there was also established the right of Superintendents or Visitors to have oversight over the teachers, who would not be permitted to teach until they had been tried by the State Visitors. This was ratified by the statute of 1581, but subsequent re-enactments point to constant evasion, and in 1616 the Privy Council, in terms less vague, permitted the establishment in every parish of a school taught by a proper teacher "at the expense of the parochinaris according to the quality and quantity of the Parish." This Act of Council was ratified by the statute of 1633 (c. 3) which provides that the parish, with the consent of the heritors and the majority of the parishioners, shall have power to impose a "stent" for the support of the school. Their efforts, however, still proved abortive, and in 1646 an Act was passed to enforce the founding of schools in every parish. This Act was repealed at time of the Restoration (in 1662), but re-enacted in 1696 with the necessary modifications. The Act of 1696 was the legal foundation of the parochial system. By this Act it was ordained that a school and a schoolmaster should be provided for every parish not already supplied; that this provision should be made by the heritors and ministers (not by the presbytery as in the Act of 1646); that the heritors should supply a commodious schoolhouse (of not less than a room and kitchen), and pay the schoolmaster a salary of not more than 200 merks and not less than 100 merks (i.e. £5 11s. 1½d.) payable half yearly, that the "stent" to be imposed to meet this expense should be according to each heritor's valued rent, that one-half should be paid by the tenant, and that if the heritors failed in their duty the presbytery should apply to the Commissioners of Supply who should have power to establish a school, fix the salary of the schoolmaster, and "stent" the heritors accordingly, any aggrieved person having the right of appeal to the Commissioners, the Sheriff, or other competent Judge.¹

¹ *Acts of Parliament* (Scotland), Vol. x., p. 63.

These and the other terms of this Act made it sufficiently comprehensive to meet the general requirements for the time being, and no further legal provision was made for education until 1803. Despite this Act there was little real progress in the seventeenth century. Indifference and passive resistance on the part of the heritors became very active resistance when their pockets were vitally affected. In the eighteenth century there was but slow improvement. Many parishes were without a schoolmaster, and in others any makeshift was considered good enough for education. The wretched salaries paid under the Act of 1696 were not augmented till 1803, when a new scale ranging from 300 to 400 merks was laid down. Under this Act also side schools were provided, where the parish was too large for a single school. The schoolmasters were examined by the presbytery, and had to sign the Confession of Faith and the formula of the Church of Scotland. The Presbytery had the power of suspending the schoolmaster or depriving him of his office.

From this point, progress is more apparent. In 1818, the educational deficiencies of the Highlands, as revealed in the Report of Lord Brougham's Committee of Inquiry, made it evident that greatly increased provision was necessary. In 1824, the Education Committee of the Church of Scotland was formed, and from 1825 onwards a determined attempt was made to meet these deficiencies by the organisation of a system of "Assembly Schools" chiefly in the Highlands and Islands. But the resources of private benevolence were unable to meet the national requirements, and "Parliamentary Schools" to meet the needs of *quod sacra* parishes were established by the Act of 1838. In 1839, a Committee of Council on Education was formed and a beginning was made with Parliamentary grants in aid of elementary education. The proceedings of this Committee, including the administration of grants, were regulated by successive Minutes till 1860, when the Minutes were reduced to the form of a Code. Meanwhile, the Disruption of 1843 had led to the enforced resignation of such teachers as had gone over to the Free Church, and it became necessary to revise the conditions under which schoolmasters should be appointed. This was accomplished by the *Parochial and Burgh School-Masters (Scotland) Act, 1861*, which removed from parochial teachers the restriction of being members of the Church of Scotland, increased

their scale of salary to a maximum of £80 and a minimum of £35, substituted the university for the presbytery as the examining body, and gave security of tenure *ad vitam aut culpam*. This Act also established Heritors' Girls' Schools, and authorised the appointment of female teachers "to give instruction in female industrial and household training, as well as elementary education" ¹

But in spite of considerable progress, it was felt that there was distinct weakness in one or two directions, particularly in respect of the fact that there was no standard of qualification for the office of teacher, and that so many teachers taught merely during the long university vacation. It was also felt that much of the so-called teaching was the teaching of words without understanding. Accordingly, a Royal Commission was appointed in 1865, to ascertain the general intelligence of the population, the interest taken by them in education, etc., in order to effect a solution of the main defects. Into the details of the work of this Commission, time does not permit us to enter. ²

The main facts emphasised by the Commissioners were want of organisation, want of supervision, and want of thoroughness in the teaching. They held, generally, that a Central Authority was wanted to act with a local Board of Management, and to include the centralisation of the whole in a national system of education. They found that 69 per cent. of the buildings, in the case of the chief parochial schools, were good, and 41 per cent. of the parochial teachers were certificated. All over, the schools did not rise above the level mediocrity. ³ The Commissioners reported improvement in the qualification of the teacher, since the Act of 1861 had taken the examination out of the hands of the presbytery, but slackness on the part of the presbytery in the examination of the schools. They accordingly recommended that Government inspection should be strictly applied to every school in the country, and that part of the teacher's salary should definitely depend upon the result of that inspection. ³ They were further of opinion that tenure *ad vitam aut culpam*

¹ Cf. (Section 5).

² Full particulars will be found in the *Report of the State of Education in the Country Districts of Scotland*, by A. C. Sellar, etc.

³ *Report*, p. 42.

was liable to great abuse. The condition of the side-parochial schools was very bad. It was difficult to get the heritors to do anything at all, and even when something was done it was only after repeated delay.¹ Of the private adventure and side-schools they have not a good word to say.² The position, the Commissioners held, called urgently for the re-organisation of the non-parochial schools.

It was evident that the parochial school had served its day, and that education must enter on a new phase if the demands of a growing population and an increasing civilisation were to be met. But before passing on to the next stage, let us briefly state the case for, and against, the parochial school. Let it be granted at once that it ultimately proved inadequate to meet the needs of the community, that it had many spots and blemishes, and that it sacrificed the great majority of the pupils to the two or three who were able to go to the university.³ On the other hand it was the means of disseminating university culture throughout the land, and it brought the university within the reach of the village school. It opened boundless possibilities to lads in every rank of life. It was permeated with the true spirit of intellectual brotherhood. Side by side on the benches of the parish school sat the sons of rich and of poor, of proprietor and of peasant, knowing so far as education was concerned, no inequality except inequality of intellect. A national system of education this, in the very truest sense of the term ! By its real national character, by the intimate relationship which it established between primary and secondary education, and by the possibilities which it offered even to the humblest of obtaining the highest university instruction and distinction, it marked off the system of Scottish Education from that of any other land. Meanwhile, as we have already said, the Minutes of the Committee of Council on Education had been embodied in a Code—the “Original Code” as it was called of 1860. This was followed, as a result of the Royal Commission on Education of 1858, by the introduction of the New or Revised Code of 1862. Although this Code was drawn up as the result of an inquiry into English education only, it followed that,

¹ *Report*, pp. 67-8.

² Cf. *Report*, p. 104, for a typical bad example.

³ *Report of Commission*, 1867, p. 103.

as Scottish education was under the direct administration of the Board of Education, the Code would also apply to Scotland. But it was quite unsuited to Scottish conditions, particularly in two respects—(1) The results of individual examination in reading, writing, and arithmetic formed the sole basis of grant-earning; (2) In terms of Article 4, the Parliamentary grant was expressly made “to permit the education of children belonging to the class who support themselves by manual labour.” The first of these was contrary to the vital principle of the Scottish Parochial School, where higher teaching went on side by side with elementary work. The second struck a blow at one of its most cherished traditions by the recognition of class distinctions. Naturally it called forth the most determined opposition. It was felt that a comparatively liberal system of education was to be absorbed in one distinctly its inferior, and that a levelling-down as against a levelling-up policy could not be defended. Ultimately Scotland was exempted from the financial operation of the Revised Code, and it was ten years before a modified scheme was introduced. In the interval a Commission of Inquiry was appointed (1864). In their Report issued in 1867, the Commissioners set down clearly the differences between the national system of Scotland and the voluntary system of England, and argue that it would not mean any peculiar privilege to Scotland to have the clause as to class distinction omitted, so far as Scotland was concerned. Apart from that they are of opinion that the principle of the Revised Code is generally sound, and that it should be extended to Scotland with the modifications necessary to prevent the standard of education being lowered.¹ The danger was for the moment averted, but even the formal application of the Revised Code gave a set-back to Scottish education, and during these ten years there was a tendency to provide in certain Scottish schools the intellectual fare the Code prescribed for England—“the three R’s in their barest form, with bills of parcels as the loftiest aim in arithmetic.”²

This brings us to the great Act of 1872. The exact position of Scottish Education is seen more clearly if we compare for a moment one or two of the features of this Act with the English

¹ Report, pp. cvi., ff.

² Kerr, *Memories Grave and Gay*, p. 57.

Education Act of 1870. The main differences arose just out of the fact that Scotland had a national system consisting of Parochial and Burgh, or Grammar Schools, supplemented by voluntary effort, whereas England had a purely voluntary system. In England, the Act of 1870 came to supplement this voluntary system. In Scotland, the Act of 1872 distinctly took the place of the parochial and national system. The parish schools had to be transferred to the School Boards, the newly established educational authorities. Alongside of these public schools, as they were now called, the voluntary school continued to be grant earning. Ultimately, with the exception of the Episcopalian and the Catholic schools, and a few Higher Class Schools, they all came into the School Board system. Burgh Schools also came under the management of School Boards.¹ The English Act of 1870 provided *elementary* education. The object of the Scottish Act of 1872 was to "amend and extend" the provisions of the law of Scotland on the subject of education, in such manner that the means of procuring efficient education for their children might be furnished and made available to the *whole people of Scotland*.² This Act cured many evils, especially in respect to the provision of adequate means of primary education, but obviously it took time to put this primary education on a satisfactory footing, and consequently it was 1886 before the Scotch Education Department came into direct touch with the secondary school, and even then only to the extent of inspection, and it was 1892 before Higher Class Schools were accorded the privilege of any Parliamentary grant. While this was so, it was also the case that in the Minute embodying the conditions under which grants should be paid under the Act of 1872, two objects were kept in view—(1) To maintain, in accordance with Section 67 of the Act, the specific character of Scottish Education and the teaching of higher subjects in the public school; and (2) to secure sufficient instruction in the elementary branches of knowledge, and to encourage good discipline and organisation throughout. Accordingly, definite grants were paid in respect of the specific subjects as they were now called, viz. :—Mathematics, English Literature and Languages, Latin, Greek, French, German, etc.

¹ *Education (Scotland) Act, 1872, Sect. 24.*

² *Ibid.* Preamble.

Pupils could be presented for these subjects, however, only under strict rules which made attention to the elementary subjects the first requisite. Whatever opinion we may have as to the merits of this method of dealing with secondary education, we must admit that by adopting it the Department recognised the possibility of the state-aided schools giving secondary instruction side by side with the Higher Class Schools, and retained one of the most noteworthy and characteristic merits of the old parochial school. But from the point of view of the organisation of secondary education, the system had one fatal defect—it did not secure a common standard either of examination or of proficiency. Moreover, the steps taken to conserve secondary education were insufficient to meet the case so long as the grants for elementary education were the greater and the more easily earned, and so long as the grants allotted to such specific subjects as physical geography and animal physiology were the same as those allotted to Latin and Greek which involved ten times the labour. It was soon evident that the Act of 1872 and the grant-earning clauses of the Code issued in terms of that Act were operating adversely in the interests of higher education, not only in this respect,¹ but also in respect of the tendency even where, e.g. Latin was taught, to take the pupils through the first stage without the least intention of carrying them further.² A partial remedy was introduced in 1890, when it was enacted that the school authorities had to submit a graduated scheme of instruction in any subject they proposed to introduce as a specific subject, and that no scheme of instruction in science subjects would be approved unless founded upon experiment and illustration.³

In this same year individual examination as a basis of grant earning in elementary subjects was abolished, and in terms of the *Local Government (Scotland) Act, 1890*, it was made possible to give relief from the payment of school fees in all the compulsory standards.⁴ In the following year the system of block grants and increased freedom of classification swept away many of

¹ Cf. *Report of the Board of Education for Scotland, 1876*, pp. xxiii-xxiv.

² *Ibid.*, 1877, p. xviii.

³ *Code of 1890—Fourth Schedule*, f.n.

⁴ Sect. 2 (ii.)

the restraints which had proved necessary in a period of transition.¹

In 1892 we are on the threshold of a new epoch. Already the *Technical School Act* of 1887, and the institution of the Leaving Certificate Examination (1888) establishing some approach to uniformity in the Secondary School, had made preparatory arrangements such as would simplify the co-ordination of secondary education. In this year money became available for secondary education in Scotland under the *Education and Local Taxation (Scotland) Act, 1892*, and by Minute of 11th August, 1892, provision was made for the distribution of the sum available, and for the constitution of Secondary Committees as the agencies for distribution. At the same time the Merit Certificate was introduced as the Leaving Certificate of the elementary school. This Merit Certificate was obtainable by passing an examination in the three R's, in two at least of the class subjects, e.g., history and geography, and in all the stages of one specific subject.

The years 1894 to 1899 show many progressive features. The primary school curriculum was extended in the departments of physical and manual training and elementary science. Complete freedom was given to school authorities to submit schemes of instruction. In 1898 a change was made in the method of inspection. Hitherto it had regulated the teaching. Henceforth the record of work done was to regulate the inspection. It had come to be recognised that a Code that prescribed every detail was a body without a soul, bound to prove disastrous to true education. The year 1899, by the transference of the Science and Art Department to the Scotch Education Department, established a single central authority. It also marks the complete severance of the elementary from the secondary school by the establishment of Advanced Departments and Higher Grade Schools intended to carry on in properly organised fashion and to extend the work which since 1872 has been inadequately done in the form of "specific subjects." At the same time substantial grants, increasing according to the stage of advancement, were made in respect of the three years of secondary instruction contemplated. The Advanced Department was a mere transitory phase, but, as we

¹ *Code of 1891.*

shall see, the Higher Grade School has developed far beyond its earliest sphere.

The *Education Scotland Act, 1908*, and the *Children Act, 1908*, mark for the time being the final stage of development. An organic correlation of education has now been effected. We have three grades of schools—elementary, intermediate, and secondary. In the first seven years—from five to twelve—the curriculum is the same in all. Reading, writing and arithmetic remain the staple subjects. To these are added what may be termed auxiliary subjects designed to afford discipline and a varied approach to the intelligence. These subjects are physical exercises, singing, drawing, nature knowledge, geography, history, and for girls, sewing. All these are regarded as integral parts of the elementary school curriculum. No work is definitely prescribed; the school authorities draw up their own courses of study, and, while the Département reserves the power of veto, its approval is never withheld from any reasonable scheme. To assist and guide teachers and managers in the preparation of the various syllabuses they have issued Memoranda on the main subjects of instruction. These Memoranda offer specific suggestions and expert advice, but do not formulate definite schemes of instruction or lay down rules of method.

On the completion of this seven years' course there is definite bifurcation following the passing of the "qualifying examination" as it is called. At this stage pupils who intend to leave school at the age of fourteen are drafted into the supplementary courses. The object of these courses is to co-ordinate the information the pupils have already acquired, and to give facilities for practical work. Boys and girls are taught in separate classes. A typical course for boys would include English, arithmetic, geometry, mensuration, woodwork, drawing, physical training and singing, and for girls—English, arithmetic, housekeeping (including cookery, dressmaking, etc.), physical training and singing. Pupils who are to remain at school beyond fourteen move on, after passing the same "qualifying examination," to the intermediate or the secondary school. The name "Intermediate" is now given to those Higher Grade Schools which offer a three years' course of instruction leading to the Intermediate Certificate which serves as the preliminary certificate admitting to Schools of Art, Schools of Cookery, and certain other Central Institutions. The term

"Secondary" includes the Higher Class School and those Higher Grade Schools which give a five or a six years' course leading through the Intermediate Certificate to the Leaving Certificate which is the qualification required for the standard of university instruction. As the work of continuation classes has now been fully codified, and the classes themselves have been organically connected with central institutions such as the Technical College and the School of Art, it will be seen that a real and systematic co-ordination of our education system has at length been established. In the secondary school the intermediate course demands a well-balanced curriculum including English and one or more languages, mathematics, science and drawing. Beyond the intermediate stage pupils, while following a broad general curriculum, are afforded opportunities of specialisation, and with the new University regulations which above all things encourage specialisation, full advantage will no doubt be taken of these facilities. Differences in the method of allocating grants are now the only point of distinction between the two types of secondary schools, and it would appear to be but a question of time before they are assimilated in a single type.

Now one admits frankly that this co-ordination is a distinct forward step and that the time was ripe for it, but one is not prepared to agree with those who so strongly urge that the absence of co-ordination under the parochial system and our education system generally up to 1892 was one of its most serious defects. We hear a great deal as to constant and vicious overlapping—so-called—with reference to these years. In particular there was, we are told, an absurd overlapping of school and university. I do not admit that the so-called overlapping was absurd. It was a necessary evolutionary stage through which Scottish education in virtue of its peculiar characteristics was bound to pass. The fact that without examination the humblest student had access to the university led to a wider diffusion of scholarship in Scotland than in any other land. It also gave rise to a more just appreciation of the value of education and the need for education, and if the university had this effect it did something which, even in the last century, was from a national point of view of far greater importance than instruction on a much higher plane of scholarship, confined to the few. From a national standpoint in the earlier and formative stages of secondary education, extension was much more important

than intention. Even in these latter days there is too much talk of overlapping. Is it overlapping when we give to the poor lad at a cheap rate in one institution the more advanced education which a richer lad can get at a comparatively high rate in another institution? If this is overlapping it will remain with us till the end of time.

Desirable as it is to weave education into an organic whole, correlation should not be a mental obsession, and I believe that the overlapping of school and university before the inauguration of the entrance examination in 1892 was not only a natural thing in the development of Scottish education, but was a thing to be desired. By this system Scotland had in attendance at the University a larger percentage of the population than any other country.¹ Nor was the lack of a central authority a drawback in the formative stage. Without local control, untrammelled by central, less interest would have been taken in education, and there would have been less appreciation of the true inwardness of local needs. In the youth of an educational system restlessness or even incautious haste is better than stagnation, unnecessary diversity than lifeless uniformity, and these are the opposing dangers of extreme decentralisation and of extreme centralisation. As the system grew the necessary centralisation followed, and to-day we have a central body prescribing the limits within which the local body shall act. A system, uniform as regards essential principles up to the age of fifteen, beyond that offering opportunities of specialisation for the remaining two or three years of the course, supplies us with a single unbroken track from kindergarten to university and technical college. It is a well-defined and excellent roadway for those whose physical and intellectual strength is sufficient to carry them to the end of the journey. But what of the others? It is all very well to talk glibly of the survival of the fittest, but there must also be a survival of the unfit. Where are they to be switched off the main track? How? Whither? Should they be on the main track at all? Or should they be confined to a branch line whose traffic is restricted to the three R's? To these and similar questions I believe our present system is, so far, the best answer. The switching off to the

¹Scotland 1: 1000; Germany 1: 2600; England 1: 5800. (*Education Commission Report*, p. ix.)

supplementary course at the qualifying stage, of the pupil who is to travel but a short distance further, is the best thing that can be done. If he is desirous of further instruction the whole machinery of the Continuation Classes, with their ultimate ramifications in Central Institutions, is at his command. True, we cannot always determine with accuracy whether this pupil will go on, and that pupil will depart, and sometimes valuable time is lost. But at worst this is the less of two evils. Every pupil must start on the main line. If it is difficult to say at twelve where he is to go, it is impossible at five, and even were it possible it would be inexpedient. He must have the chance of going on. And even apart from that the three R's, while they may have been sufficient to meet the wants of a more circumscribed age, supply the possibilities of only the meanest intellectual intercourse between man and man. But more is necessary to-day. The environment of the child is much more complex. Science, to mention but one department of learning, has revolutionised modern life and made a knowledge of more than the three R's essential even for the humblest. It is easy to talk of "fads and frills" as if the curriculum even of the elementary school were a matter to be arbitrarily arranged. Far from it. The curriculum develops in proportion as society develops fresh needs. It is important to emphasise this especially as we are so apt to look upon education as a thing apart instead of something that enters into the very warp and woof of our social fabric. Society demands, education supplies. "The modification going on in the method and curriculum of education is as much a product of the changed social constitution, and as much an effort to meet the needs of the new society that is forming, as are changes in modes of industry and commerce."¹ The needs of society, the nature of the child—these in combination form the foundation of a rational curriculum. The needs of society demand specialisation. The curriculum must make it possible for the pupil to specialise when he reaches adult life. To that end, if the dangers of specialisation are to be counteracted, the school course must be broad and varied. Specialisation in the world of letters and of science is, no doubt, fatally narrowing, but what of the great artisan class who in the elementary school are our main concern? What of those who are to remain hewers of wood and drawers of

Dewey, *The School and Society*, p. 20.

water to the very end? Is our curriculum to make them men or merely workmen? The voice that says to each of them "by the sweat of thy brow shalt thou earn thy bread," also says "man shall not live by bread alone." If this higher living is to be possible we must not stop at the three R's. Think of their daily routine. The old apprentice system is becoming a thing of the past. In the factory, specialising at every turn, they pick up some haphazard knowledge. The factory dwarfs their manhood. Tied to a machine, turning out part of a part, they lose their creative genius and even their joy in the work, and as Stevenson says "to miss the joy is to miss all." We must give them something in the day school which they can carry into their lives. We must lead them to perfect their education in the continuation classes. We must give them some real knowledge of their craft. We must save them from the soul-consuming monotony of the factory system. To have learned our responsibility here is to have made a distinct forward step in education, and the Act of 1908 has put that task upon us.

From another point of view also our curriculum is an index of educational development. I mean from the historical standpoint. In the earliest stages as we have seen it consisted nominally of the Trivium and the Quadrivium, but in reality in the first period of church dominance, it meant no more than Latin for purposes of speech, a little music for the church services, and a very little arithmetic. Speaking generally, this answers our test. Latin was the sole language of intellectual intercourse. Power to express himself in Latin and to take part in the church services was all the educated man required. As the years went on a nearer approach was made to the Trivium and Quadrivium. The scheme of the Reformers makes this clear. But the spirit of the intellectual revolt that was so important a factor in the Renaissance and the Reformation movement educationally considered was hardly strong enough to overcome the *vis inertiae* of established custom. Even when it was coming to be understood that all thought was not bound up in the systems that for centuries had passed for Aristotle's, there was little opportunity of striking out in fresh directions so far as popular education was concerned, for popular education demanded a study of the vernacular, and this in turn required increased skill in printing and more and cheaper books. Still while popular education was

waiting for a national literature the echo of what was transpiring elsewhere was turning men's minds to the knowledge of new avenues towards truth. Men like Bruno were questioning the soundness of existing beliefs in religion, science, and philosophy. True "the official guardians of orthodoxy" burned Bruno (1600). But they failed to carry conviction to his fellow men or to deter men like Bacon (1605), Kepler (1609), Galileo (1616), and Harvey (1628) from the search. In Scotland in the closing years of the sixteenth and the opening years of the seventeenth century the Renaissance movement, except through enlightened men like Andrew Melville, born half a century before their time, had scarcely introduced men to the real beauties of classical literature. Right on through the later seventeenth and the eighteenth century the classics formed the only means of liberal culture, though the feeble voice of an infant science was now being heard, and the claims of the vernacular were being more strongly asserted. In the nineteenth century the modern languages and a growing national literature had justified their inclusion in the curriculum, and ere the century closed science had become a formidable rival of the classics. This was a necessary result in view of the tremendous part science was playing in daily life. To-day the claims of an all-round curriculum are fully established to meet the infinite variety of our needs. We have again reached the spirit of the wider humanity which had so transient a life at the great Renaissance, that humanity which takes its culture materials not from the classics alone but from the whole field of human pursuits and activities, which asserts that men have not only varying capacities but also divers susceptibilities, which insists that the maximum variety of subject matter is necessary for the maximum development of the individual and of the race, and which holds that education means more than knowledge or even culture—that it means the use of that knowledge for self-development and for participation in the whole natural and spiritual environment of man. In all this we do not belittle the classics. Our language and our thought are too deeply rooted in classic soil. The imagery of Homer and Plato, of Horace and of Cicero, are too closely woven into our literature and our life. But modern literature and science are necessary even for intelligent intercourse with one's fellow-men. And again there is the survival of the unfit, those who have wrestled with the

simplest elements of Greek grammar and have not prevailed; those who have agonised over Latin *accidence in futuram oblivionem*. In these days of vocational studies it has come to be recognised that utilitarianism and culture are not necessarily in opposition, but are indeed strongest when wedded to one another. We no longer believe that the tree of culture grows only in classic soil, and that scientific soil is useful only for the market garden where such basely utilitarian things as potatoes and cabbages are the main concern.

And if the development of Scottish education is notable for the increase of culture elements in the secondary school, what shall we say of the primary? Leaving out of account the meagre syllabus of the Sang School and the Lecture School, we find that the three R's continued to be the only elementary pabulum down almost to our own day. The giving of information to the child was the sole pedagogic aim. A slip or two in arithmetic, a few individual characteristics differing from accepted usage in a highly arbitrary system of spelling, and the child was in most cases set for another year to tread the same weary round. Such education, in so far as it appealed to anything, appealed entirely to the head. It neither fired the imagination nor did it touch the heart. Hand and eye it left neglected and unheeded. But a truer knowledge of the child has shown this to be utterly wrong, and the narrow realm of the three R's has been invaded by a troop of subjects intended to cultivate the motor elements, observation, induction, the adaptation of means to ends, and the multiplication of interests in our pupils. Time does not permit us to detail the part played by each of the various subjects auxiliary to the three R's. Let me illustrate, however, from manual training. This was a most valuable addition to the school curriculum. At school age motor activity is tremendous. Manual work satisfies the natural impulse to create and do. Besides it is equally important from the ethical and disciplinary standpoint. It not only gives power to create; it also gives pride in production and fosters the spirit of self-dependence. The spirit the boy brings to the workshop is perfectly apparent as the work proceeds. Deception and evasion are impossible. Incorrect planning and unskilful or slovenly work are bound to result in a faulty product.

Development is equally obvious in the field of method, whether

we regard it from the theoretical or from the practical standpoint. In the earlier monastic schools, as we have seen, method was confined to imitation and memorisation ; in the scholastic age it was given up to logical analysis ; even the Renaissance did not raise it above mechanical drill ; in the Reformation age it aimed at the cultivation of dialectic ability and reverence for authority. In the Jesuit schools of this period we see the first glimmerings of a reasonable method since the Christian era. The sense-realists of the seventeenth century, as was to be expected, founded upon induction, but while the seventeenth century theorist diligently preached "matter before form" the seventeenth century school-master as sedulously practised "form before matter." In the eighteenth century and the first half of the nineteenth century, Rousseau (1712-1778), Pestalozzi (1746-1827), Herbart (1776-1841), and Frœbel (1872-1852), opened up new vistas in the sphere of method. Precept, however, was one thing, practice quite another, and the old methods founded upon adult psychology held stubbornly on. To-day we find a vast improvement, and the first great forward step was made when we began to understand that what we can do with the child is primarily determined by what he is, not what he is to become. This theory, generally attributed to Rousseau,¹ is as old as the days of Plato. We have come to realise that the logical order in education must give place to the psychological or chronological. For example, the child speaks before he understands the materials of grammar. It is but right, therefore, that his story-telling instinct should be utilised instead of his being set to grapple with the abstract and the formal. We now recognise that "curiosity is the bud of mind," and that the child who ventures to put a question is no longer to be promptly suppressed like the guinea-pig of *Alice in Wonderland*. We have even come to admit that it is the person who desires information that should be the questioner. We no longer believe that compulsion is better than attraction, or that interest and effort are inimical. You may remember that when Tom Tulliver was foolish enough to express his hatred of Latin grammar his teacher at once concluded that a little more of that subject was exactly what Tom required for disciplinary purposes. We have got quite beyond that stage. We no longer necessarily identify duty with

¹ E.g., *Emile*, Bk. iii.

the disagreeable. Another notable advance is in our treatment of the mentally deficient. He is no longer regarded as a nuisance to be left severely alone, but rather as "a rare and inviting individual who may not be dismissed until he has yielded up the secret [of his defect]."¹

Now, while I have emphasised the strides Scotland has made in educational development, I do not wish to imply that our system is yet perfect. Far from it. We frequently hear of this lack of perfection—in the public press and elsewhere. The voice of the pessimist is loud in the land. The amateur educationist who, like the poor, is always with us, tells us our school fabric is rotten to the core, and offers us his sympathy and advice. The business man tells us that our system is a failure, that boys cannot work the easiest problem, that their writing is of the nature of hieroglyphics, and that they each and all possess a simplified and individual taste in punctuation and in spelling. Are such statements well founded? Are essential subjects neglected? Are the pupils inaccurate? Is time wasted on non-essentials? The answer largely depends on our point of view. If we do not ask for culture but only for mechanical accuracy, efficiency, and speed, if proficiency in the three R's is to be the only test of our curriculum, and if less time is to be given to these staple subjects of instruction it almost inevitably follows that the same speed and accuracy will not be attained. But, as has been said, the school curriculum is determined and conditioned by the needs of the individual and of the race. The object of education is not only to fit a lad to earn his living; it must also fit him for life, which is by no means the same thing. It is always a difficult and dangerous thing to measure education by mere materialistic standards. The higher we advance in the scale of civilisation the longer a preparation do we require for the work of life. Life has become more complex and the human mind grows in complexity with it. The elementary school has been forced by the laws of human progress to go in more and more for culture values. It necessarily follows that work, definite and practical, for business and for commerce must be given in the Secondary School, and specialisation in such a course cannot begin until the age of fifteen, up to which age a lad has to follow a well balanced all-

¹ Stratton, *Experimental, Psychology and Culture*, p. 184.

round curriculum such as shall fit him to understand his environment. But the business man too often says, "I do not want a boy of that age," and he takes one who had just reached the leaving age of the elementary school. Now we all know the clumsiness of a boy of fourteen. He has no more than reached the frolicsome puppy stage, yet the business man takes him and then grumbles that he has not got the finished article. Others are chosen from the secondary school, but it is notorious that the commercial classes of the secondary school boy for boy are much inferior to the classical. Into the commercial course drift the flotsam and jetsam of education. Why? They have no goal to strive for. They are not eager to work. They do not get along well at school, and so they go out into the world and the secondary school is judged by their proficiency. More blame, if blame is to be attached at all, is to be attributed to the business man who attracts the boy from school than to the boy who goes. They understand things better in Germany and in America. It is possible that the present secondary course aims over much at the university, but the aimless drifting of the commercial course would be removed if business men helped the school authorities.

Both amateur educationist and business man draw an exaggerated picture, and neither puts his finger on the real weakness—the dangers arising from the very perfection of our machinery and equipment; from over-teaching, which leaves the pupils little time to think, and brings them to a dead halt when face to face with something for which they have no specific educational recipe; from our artificial haste, with its attendant evil of an over-crowded curriculum; and from the tendency to regard, wrongly, each *subject* of instruction as a thing apart, and to think of culture as a factory-made product which resolved into its constituent parts consists of so many rules of grammar and of arithmetic, so many facts of science, so many masterpieces of literature read or memorised. To all this we must add the further danger in these days of Merit Certificates and Leaving Certificates of regarding the education of the school as rounded and complete.

The Act of 1908 naturally turns our thoughts to the future. This Act, imperfect and fragmentary in some directions, is a great Act in one respect. It recognises the unity of educational forces and concerns itself with the whole well-being of the child. It realises the impossibility of educating the cold and the hungry and

the necessity of making the fit child more fit. It points us to an education which is to form an integral part of our daily life. It shows us that education must accommodate itself promptly to significant changes in the character of the people for whom it exists, that it is not merely a question of teacher and pupil, but of society towards its members. From the social standpoint it follows that if the individual is to receive education at the hands of the State, then it is his duty to render to the State equivalent service in return. If a man's real value is to be measured in terms of his service to his fellow-men, then it follows that if our schools are really to play their part they must consider a curriculum in terms of the fundamental needs of society. What is true of society in general is true of any particular locality. We drive the pupils away from education altogether if we are not ready to adapt the curriculum to local needs. It is essential that both parents and pupils should be given the idea that they are receiving direct practical benefit from their studies. From the local standpoint, one business of education is to learn what are the local needs, and then, with due regard to all-round development, to satisfy them. But naturally the methods of fitting pupils for social service differ in different grades of schools. This involves flexibility in the curriculum of the lower school and variety in the upper. The curriculum, to be effective, must have regard to current needs. These needs will vary not only with the community but also with the individual. For such as are unfit to go far we must provide an education that will carry them as far as they can go. We must see to it that no one drifts aimlessly along. If he is fit only for an elementary vocational course let him have the best we can give him. I do not say that "bread and butter" courses are the solution of social or any other efficiency, but I do say that it is better that a man should be a good artisan than a bad surgeon.

Since 563 we have travelled far, and we are now travelling fast. In the truth of to-day is the half-truth of to-morrow, to be set aside as we reach deeper knowledge. Development is no mere groping in darkness and chaos, but a steady going forward towards a goal we have deliberately set before us. Development must give us life and must give it more abundantly. If our system is to be a national system it must supply, in the highest sense, national needs. It must not give us early specialisation but a more liberal training and a wider outlook. It must guard us against sending

the child "forth from dead tasks into a dead world."¹ It is, after all, by its power to form character that education must stand or fall. It must have less of the factory system in it if there is to be development of thought and of imagination. We must educate the child and not merely make it possible for him to obtain education. The curriculum of the future must involve increased flexibility and greater variety, and must avoid, above all things, the dead level of uniformity. "The school must raise man's mind from his liking to his belief in duties, from his instincts to his ideals, that art and science, national honour and morality, friendship and religion may spring from the ground and blossom."² Education is not a device for the improvement of mere material well-being. It has also to do with ideals and aspirations, and the studies which deserve the supreme place in the school of the future are those which will stir in the pupil a knowledge of his own and of his fellows' most vital needs. It is this higher individualism that we must emancipate. The opening note of the century teaches us that "the individual alone is nothing, but that the individual as a member of society and of the race is everything."³

The problems before us are vast and complicated. The stream of intellectual progress which we now see flowing with ever increasing volume has been fed by many a side stream since first a tiny rivulet it left its headsprings in the uplands of time. Worn out with incessant changes, which we do not always identify with progress, we often sigh for the simplicity of early days, but only in pages of the poet does the "yellow Tiber" ever flow backwards from the sea, and we who have inherited the aggregated wisdom of the ages must face our difficulties boldly. We must play our part well if we are to hand on a goodly heritage to those who are to follow.

¹ Kappa, *Let Youth but Know*, p. 176.

² Münsterburg, *American Traits*, p. 69.

³ Butler, *Educational Reform*, p. 13.

The History of Mummification in Egypt. By Professor G. ELLIOT
SMITH, M.A., M.D., F.R.S.

[Read before the Society, 6th April, 1910.]

[ABSTRACT.]

To appreciate the motives which impelled the ancient Egyptians to invent the art of embalming, it is necessary to throw our minds back to that remote period, nearly sixty centuries ago, long before the amalgamation of the Kingdoms of Upper and Lower Egypt was effected and the first dynasty of Egypt was founded (circa 3400 B.C.), and study the customs of the earliest inhabitants of the Nile valley whose bodily remains have come down to us.

These predynastic Egyptians were in the habit of burying their dead in shallow holes scraped in the soil immediately beyond the limits of the narrow strip of cultivated land. As the result of placing the body in hot, dry sand it frequently happened that, instead of undergoing a process of decay, it became desiccated and preserved in an incorruptible form for all time. The burial of valuable and useful objects with the dead so excited the cupidity of his contemporaries that they were unable to restrain themselves from desecrating the cemeteries for plunder: so that grave-robbing was already a common practice in the earliest known prehistoric times in Egypt. [See Dr G. A. Reisner in Griffith's *Archæological Report for 1900-1901*, p. 25 (*Egyptian Exploration Fund's Publications*).]

Thus, at this remote period, the activity of the grave-plunderer must have led to the diffusion amongst the community at large of the knowledge that the dead did not always "suffer corruption," but frequently "put on immortality," in the sense that the operation of the forces of nature often led to the desiccation and preservation of the body.

This is not mere conjecture, for we know from the ancient writings of the people themselves ("the Book of the Dead") that

they were fully aware of the fate of the body in the grave, and gave the most realistically gruesome accounts of what might happen to it.

With the certainty that the earliest Egyptians possessed this knowledge, we must look upon it as something more than a mere coincidence that it became an essential tenet of their religion to regard the preservation of the body as the condition of the attainment of immortality, and that, in addition to the soul (*Ba*) "which flew to the gods," there was a second soul (*Ka*) that remained on earth and dwelt in the body or its neighbourhood.

The predynastic Egyptians were acquainted with copper, and were beginning to realise the manifold uses to which this knowledge might be put in fashioning weapons and workmen's tools. Just about the time of the first dynasty this gave a great impulse to the arts of the carpenter and stonemason (see Reisner, "The Early Dynastic Cemeteries of Naga-ed-dêr," 1908), and it is not surprising, when we recall the immense importance which their religious beliefs lent to the treatment of the remains of their dead (*vide supra*), that this enhanced technical skill was placed immediately at the service of the undertaker, and led to the invention of the coffin, the sarcophagus, and the rock-cut tomb. For, seeing that the preservation of the body was considered essential to the attainment of eternal life, it was natural that as much care as possible should be lavished on providing a dwelling-place fit to house and protect the doubly precious remains.

But the early Egyptian could hardly have anticipated that this aggrandisement of the tomb was destined to defeat the very object—i.e. the better preservation of the dead—which inspired its construction.

For he soon came to learn—in the same way that his fore-runners acquired their knowledge of such matters—that the body, when put into a coffin or buried in a rock tomb, was no longer preserved by the forces of Nature, as was the case when it was placed in the hot, dry sand: for, being now exposed to a quantity of air, and often to moisture also, it usually underwent decomposition.

Thus it happened, at about the time of the first dynasty, that the Egyptian, who had now grown up in the knowledge that the dead might often be preserved in an incorruptible form, and had acquired the firm belief that such preservation was *the* great

essential factor in the attainment of immortality, became aware of the fact that the very measures he was adopting for the purpose of more certainly assuring this, to him, desirable end, were defeating that object in that they were conducing to the destruction of the body. It thus became a widely held view among the ancients that the stone "ate the flesh" (*sarcophagus*) of the dead.

In this we have the incentive to the attempts at the preservation of the body—the attainment by art what these people knew by experience Nature unaided often accomplished.

They had long been familiar with the materials which were necessary for embalming, for they had been using them for other purposes for generations before they were employed for mummification, and their more obvious properties must have been quite well known to the predynastic Egyptian. Salt and soda occur in the deserts fringing the Nile valley ready at hand and in enormous quantities; and even in predynastic times the Egyptian woman had learned to enhance her charms by the application of face-paint; and resin, such as the embalmer now began to employ, entered into the composition of these cosmetics. (See Elliot Smith, "Notes on Mummies," *Cairo Scientific Journal*, Vol. ii., No. 17, Feb., 1908; also, Reisner, Bulletin No. 1, *Archæological Survey of Nubia*, 1908, p. 17, and Plate xiii.)

If this hypothesis as to the origin of the attempts at mummification is the true interpretation of the facts, we should expect to find some evidence of embalming soon after the invention of coffins and rock-tombs, i.e., about the commencement of the dynastic period. Moreover, this accorded with the assumption commonly made by archæologists and historians that the practice of embalming was as old as the history of Egypt.

But when I came to examine the mummies in the Cairo Museum, which of course contains far and away the largest and most important collection in existence, it was with some surprise that I learned that there was no mummy, the authenticity of which was beyond question [on this point see my remarks in the *Cairo Scientific Journal*, Vol. ii., No. 20, May, 1908, p. 205, and *op. cit. supra et infra*], earlier than that of the last king of the seventeenth dynasty (circa 1580 B.C.). Thus there was a gap of eighteen centuries between the time when, on my hypothesis, the earliest attempts at embalming were made and the most ancient actual mummy in the Cairo Museum.

But there was definite evidence that, even though we had no *actual* mummy earlier than 1580 B.C., the embalmer's art was certainly practised in Egypt as early as 2000 B.C., and possibly even 1000 years before that time. The evidence for these views I set forth in detail in 1906 ("A Contribution to the Study of Mummification in Egypt," *Mémoires de l'Institut Égyptien*, tome V, 1906, p. 9) and a few months later my friend Mr J. E. Quibell brought to light at the Sakkara Pyramids two mummies of the time of the tenth or eleventh dynasties (circa 2100 B.C.), which he kindly permitted me to unroll (see Quibell's "Excavations at Saqqara," 1906-1907), and less than two months later Messrs Lythgoe and Mace found a mummy of the time of the twelfth dynasty at the Lisht Pyramids, which they kindly permitted me to examine (Lythgoe, *Bulletins of the Metropolitan Museum of New York*, 1907).

These three mummies were in such a fragile condition that it was not possible to move them without reducing them to mere bones and powder. This seemed to explain why it was that no *actual* mummies of this period were found in museums. In commenting upon these facts ("Notes on Mummies," *op. cit.*, 1908, p. 4) I became more than ever convinced that mummification must have been practised much earlier, perhaps as early as the times of the first Pyramid-builders.

In reply to this statement, Professor Flinders Petrie called my attention (*Cairo Scientific Journal*, May, 1908, p. 204) to the fact that he had found a mummy of the time of Snefru (third or fourth dynasty) in the neighbourhood of the Medum Pyramid in 1891, and had had it transferred to the Museum of the Royal College of Surgeons in London.

Professor Keith, the Conservator of the latter Museum, kindly permitted me to examine this body, and I found it to be a genuine mummy (see *Nature*, 1908, p. 342). Seeing that the much later mummies found at the Sakkara and Lisht Pyramids were not in a state that permitted removal, except as skeletons, it became a matter of crucial importance to determine whether this mummy, found as it was in a plundered tomb, really belonged to the remote age assigned to it by Professor Petrie (circa 2900, or more, B.C.).

These elements of doubt were suggested not only from the fact that the tomb was plundered (see Petrie, "Medum," Egyptian Exploration Fund's Reports, 1891); but it was not certain for

PLATE IV.



[Photograph by Mr H. George.]

THE MASK OR RESIN-IMPREGNATED ENCASEMENT OF THE HEAD OF
THE OLDEST KNOWN MUMMY.

whom the tomb was made (although it was supposed to belong to a certain Ranefer or Ranofir), and, moreover, the fact that it was near Snefru's Pyramid did not prove that it was made in the times of Snefru, for guardian priests of the Pyramids were maintained to look after these royal tombs for ages after they were built, and the bodies of these priests were buried alongside the objects of their charge.

The important researches, which Dr George A. Reisner has been carrying on at the Giza Pyramids, have supplied the data for resolving these uncertainties (see *Nature*, March 31, 1910, p. 136) and demonstrating that this mummy was embalmed at the time of the fifth dynasty (circa 2700 B.C.). The reason why this mummy has come down to our times in such a remarkably good state of preservation is that it was encased in a hard and thick carapace of resinous paste, which had been moulded, when soft, into the form of the body. The head and face had been particularly well-modelled (see figure): the wig was faithfully represented and coloured brown with a resinous paste painted on the surface of the mask: the features (nose now destroyed) were carefully fashioned, and the eyes (pupils, eyelids and eyebrows) were indicated by malachite paint; and the moustache, represented in Egyptian statues only at the period assigned to this mummy, was painted on the upper lip of the mask with brown resinous paste like that employed to represent the hair of the wig.

From internal evidence, therefore, we know that this mummy can be referred back to the time of the fifth dynasty (2700 B.C.). It is thus more than eleven centuries older than any other *actual mummy* (i.e., not the mere bones which represent all that now remains of a body that may have been mummified) contained in a museum, and six centuries older than those fragile specimens found by Mr Quibell, which could not be moved except in the form of separate bones.

For the reasons indicated above, it is highly probable that attempts at embalming were being made during the six or seven centuries preceding the mummification of the body supposed to be Ranefer's.

[By means of a series of lantern slides the lecturer then sketched the chief phases in the evolution of the embalmer's art up to its culmination during the times of the New Empire. He then

described the curious methods, practised during times of the twenty-first and twenty-second dynasties, of packing material under the skin to restore the form of the body and make it a complete simulacrum of the deceased (see *Mémoires de l'Institut Égyptien*, *op. cit. supra*) ; and gave a resumé of the history of the decadence of the art in Greek, Roman and Christian times, as presented in detail in the Reports of the Archæological Survey of Nubia. He referred to the extinction of the practice in Egypt in the seventh century A.D. when Islam was introduced ; and to the curious fate of many mummies as *materia medica* of mediæval physicians and pigments of modern painters.]

The Metric System of Weights and Measures: some Practical Considerations regarding its proposed Compulsory adoption in the United Kingdom. By CHARLES MACDONALD, Chief Inspector of Weights and Measures, Glasgow.

[Read before the Society, 9th February, 1910.]

It was my purpose when I undertook the preparation of a paper on this subject to consider specially the question of the cost which a change to the Metric system would entail to shopkeepers and others who use weights, etc., in trade, on account of having to discard existing weighing appliances, and the inconvenience which would be occasioned to buyer and seller owing to their unfamiliarity with the new system. Before treating of that aspect of the question, however, I wish to refer briefly to some of the characteristics of our imperial weights and measures, and also those of the Metric system of weights and measures. In this way the whole question of the proposed adoption of the Metric system will come before the meeting.

In Dr Arbuthnot's "Tables of Ancient Coins" (1754) we are told that, according to Josephus, the historian of the Jews, Cain was the first man to break the public tranquility by the use of weights and measures. Whether that statement is reliable or not, it is true that weights and measures have been in use from the very earliest times. Their use is probably prehistoric. They are a necessity in the greater number of commercial transactions, and great have been their services to the chemist and the analyst. Simplicity, accuracy, expedition and uniformity are desirable in their use in greater or lesser degree according to the purpose which the user has in view.

With regard to the attainment of accuracy, we in this country have made great progress in recent years, and much has been done also to facilitate expedition in weighing and measuring. In the matter of the attainment of simplicity and uniformity, however, progress has been dead slow. One of the clauses of the Magna Charta was to the effect that there shall be one weight and one measure throughout the realm. At the present time we have in

concurrent use in Great Britain and Ireland four systems of weights and measures, and simplicity is not a characteristic of some of these systems.

A time has come, I believe, when something beyond the aim of that clause in the Magna Charta should be attempted. The insular uniformity which was the ambition of the commercial man of the thirteenth century should not satisfy the ambition of the commercial man of to-day. World-wide uniformity in the system of weights and measures used should be the ideal of to-day. We pride ourselves on the fact that the pound weight and its multiples and divisions are the same in Aberdeen as in Dover; yet, notwithstanding our immense export and import trade, when we cross the channel to Bolougne, the pound weight is not known and is not understood.

Our Troy, Apothecaries and Avoirdupois systems, especially the Troy system, have considerable claims to antiquity, and the history of each system is intermixed with that of the other. But these systems do not satisfy us. There is strong proof against them in the fact that, notwithstanding their antiquity, and the numerous instances of the foreigner copying our methods and instruments, no instance can be cited of our weights and measures being adopted by any people other than the English speaking race. Each of these systems came into existence in a more or less haphazard fashion. The length of a number of barley corns, the weight of a number of wheat corns, the length of a Royal arm, or the width at the root of the nail of the thumb of a "middling man, not over mekle nor over little, but betwix the twa" formed the basis of our units. The units possess no inter-dependence among themselves. The highest claim, probably, which is made for the Avoirdupois system as a system, is that it has in recent years been improved by the creation of standards of 100, 50, 20, 10 and 5 lbs.—that is, on a decimal basis—and that it is capable of being further improved in a like direction.

It has, however, to be kept in view that improve our imperial system as you will by altering the multiples and divisions and adopting a decimal basis, you are left with an insular system. I am aware that a powerful Association, known as the British Weights and Measures Association, has been instituted with the object of opposing the compulsory adoption of the Metric system and improving and defending our imperial system. Their aim is

the carrying out of the clause in the Magna Charta to which I have already referred. In other words their objective is uniformity for the English speaking race. That is an objective which, in my opinion, is sadly out of harmony with our world-wide commercial relations and our business instincts, and I hope it will not satisfy the British nation.

Apart from the inherent defects of the Troy, Apothecaries and Avoirdupois systems, the concurrent use of these systems leads to further complexity, inconvenience, much loss of time in schools, and error. The grain is the same value in the three systems, and the ounce is the same value—480 grains—in the Troy and Apothecaries systems. But the ounce Avoirdupois is only $437\frac{1}{2}$ grains. A wider disparity exists between the Avoirdupois dram and the Apothecaries drachm, the former being equal to $27\frac{11}{32}$ grains, and the latter to 60 grains. As to whether this anomaly is likely to lead to confusion or error I cannot do better than quote briefly from the speech delivered in the House of Lords on 23rd February, 1904, by the late Lord Kelvin, in seconding the motion for the second reading of the Weights and Measures (Metric System) Bill. Lord Kelvin said :—

“The avoirdupois dram is $27\frac{11}{32}$ grains, whilst the apothecaries drachm is 60 grains. I speak feelingly with regard to that difference. Some 44 years ago there existed an epidemic which Lord Palmerston called a ‘rifle fever.’ I was myself afflicted with the disease ; so much so that I had the honour of being appointed to the Captaincy of the 77th Company of the Lanarkshire Rifle Volunteers, and I made numerous experiments in my laboratory on rifles. While experimenting I was very nearly blown up, in which event I should not have been here to-day supporting the adoption of the Metric system. Two-and-a-quarter drachms was the proper weight, but I had weighed out two-and-a-quarter drachms of 60 grains. I thought it appeared rather large. I looked up the matter and discovered the mistake just in time to prevent the rifle exploding and killing me. I have a strong recollection of my feelings as to the danger arising owing to the resemblance in name of two weights drawn from different tables.”

Other most glaring instances of confusion might be given. In the sale of hay or straw in Scotland the stone may be 8, 14, 22, $22\frac{1}{2}$, 23, 24, or 28 lbs. according to the district in which the transaction takes place. Yet the sale is by the stone. In the sale of grain the boll may be 140, 240, 264, 280, or 320 lbs., and grain is frequently sold by the boll. It appears unnecessary, however, to pursue this aspect of the subject further, as those who are

most opposed to the compulsory adoption of the Metric system, and advocate the retention of the imperial system, admit that the latter requires alteration and improvement. But how do they propose to improve it? The answer to that question is given variously. One answer obtained from witnesses before the Select Committee of 1904, and from other sources, is that the Avoirdupois system should be further decimalised by sub-dividing the pound into ten parts instead of sixteen, and again sub-dividing the new ounce into ten parts. That would, however, involve a new value for the grain. It could be carried out only by rendering the present grain and its multiples and divisions illegal. It would involve a change quite as great and more confusing than the change to the Metric system, and we should still be left with a system not understood in other European countries.

I conclude my remarks on the Imperial system with another brief quotation from the late Lord Kelvin :—

“What could be more monstrously absurd, more wantonly brain-wasting than that system.”

Let me now turn to the Metric system. This system of weights and measures was first adopted by the French Government in 1793, to take the place of the old and chaotic weights and measures which had been in use for centuries in France. There seems little reason to doubt that the system was conceived in the mind of a famous Scotsman whom Glasgow for a number of years had the honour of counting among its citizens—James Watt. This is what the late Lord Kelvin said on that topic :—

“In a letter dated 4th February, 1783, James Watt laid down a plan which was in all respects the system adopted by the French philosophers seven years later, which the French Government suggested to the King of England as a system that might be adopted by international agreement. James Watt’s object was to secure uniformity, and to establish a mode of division which should be convenient, as long as decimal arithmetic lasted.”

An attempt has been made to disprove that James Watt had any share in originating the Metric system. A copy of the letter to which Lord Kelvin referred is in my hands, and satisfies me that, while James Watt did not in his letter deal with the units such as ultimately became the basis of the Metric system, the method of sub-division suggested by him was precisely the method followed in the Metric system. I give an excerpt from the letter of James Watt. He said :—

“My proposal is, briefly this—let the Philosophical pound be 10 ounces or 10,000 grains, the Ounce be 10 drams or 1,000 grains, the Dram be 100 grains. . . . Our Avoirdupois pound contains 7,000 of our grains and the Paris pound 7,630 of our grains, but it contains 9,376 Paris grains, so that the divisions into 10,000 grains would very little affect the Paris grain. . . . I have some hopes that the foot may be fixed by the pendulum, and a measure of water and a pound derived from that, but in the interim *let us assume at least a proper division, which from the nature of it, must be intelligible as long as decimal arithmetic is used.*”

It is therefore clear, to me at least, that James Watt was one of the scientists who had a share, probably the most important share, in originating the Metric system of weights and measures.

The Metric system is so simple and so well understood by an audience such as I have the honour to address, that a brief statement only of the main points is all that is necessary. It is founded on the metre—equal to 39·37079 inches. All units of the system whether of length, surface, volume, capacity, or weight, are based on the metre. Originally the metre was one ten-millionth part of a quadrant of the meridian, but it is now defined as the distance between two points in a certain bar of metal.

The units of the system are :—

Length.	<i>Metre.</i> —Divided into 100 centimetres.
Surface.	<i>Square Metre.</i> —Divided into square centimetres.
Bulk.	<i>Cubic Metre.</i> —Divided into cubic centimetres.
Capacity.	<i>Litre.</i> —Divided into 100 cubic centimetres.
Weight.	<i>Gram.</i> —The weight of one cubic centimetre of distilled water at its maximum density.

The multiples of each unit are ten times, one hundred times, and one thousand times the unit, while their divisions are a tenth part, a hundredth part, and a thousandth part of the unit. It is thus simplicity in itself, and has a thorough sound scientific basis.

With regard to the nomenclature, Latin words were chosen for the weights and measures which are decimal parts of the units, and Greek words for those which are decimal multiples of the unit. Thus “deci,” “centi,” and “milli” signify a tenth, a hundredth, and a thousandth part of the metre, while “deka,” “hecto,” and “kilo” signify ten, a hundred, and a thousand metres.

The time-saving merits of the system have appealed strongly to the teaching profession and to business men who have made themselves acquainted therewith. This is, of course, because it

is a decimal system. It is so easy to multiply or divide by ten or multiples of ten as compared with figures which are not ten or multiples of ten. Our unwieldy tables occasion enormous loss of time. This waste of time begins when our boys and girls are learning tables at school. It continues when they put these tables into practice in compound addition, subtraction, multiplication and division, and in the whole of after life whenever this part of their education is put into practice.

The merits of the Metric system, as compared with our Imperial system, are such as to commend it for use in our home trade. Its value in connection with our foreign trade produces, however, a much stronger argument. Great loss of trade and commerce undoubtedly results from our using for exported goods a system of weights and measures which is incomprehensible to the foreigner. British Consuls in foreign countries have reiterated time after time warnings as to the loss of British trade from this cause. The foreigner frequently prefers to pay more and get less good quality from sources where weights and measures are used which he can understand. The following is an extract from a report which appeared in the Board of Trade Journal of the 15th February, 1900, and which had been forwarded to the Wolverhampton Chamber of Commerce by the British Consul at Amsterdam. The report had special reference to the classification of German iron manufactures, and deals with the commercial value of the Metric system.

“The Iron and Steel Manufacturers Unions of Germany,” said the Consul, “have adopted a uniform system of dimensions (based on Metric weights and measures). The classifications are making more and more progress in Germany, not in the iron trades only but in other manufactures. In the future Germany and the Continent generally will have a constantly increasing advantage over British manufactures in foreign countries unless the Metric system is fully and entirely adopted by Great Britain. I may mention as an undoubted fact that the preference which Germany has obtained here over Great Britain as regards Railway material is mainly owing to the existence of this Metric classification.”

This is only one of the many statements containing serious warnings which have reached this country from representatives of Great Britain in foreign lands.

The large number of countries in which the Metric system has been compulsorily adopted is evidence of the impregnable position

in which it now stands. It has come to stay. We are often described as a nation of shopkeepers. Alongside that description place the fact that the Metric system of weights and measures has been compulsorily adopted by every civilised nation of the world except the British Empire, the United States, and Russia. The delay in making the change then appears very unbusinesslike.

It may be desirable here to recall briefly the various steps which have been taken in this country towards the adoption of the Metric system. In 1895 a select Committee, presided over by a distinguished man of science—Sir Henry Roscoe—reported very fully in favour of the compulsory adoption of the Metric system within two years. In 1897 the Weights and Measures (Metric System) Act was passed. It legalised the use in Great Britain and Ireland of weights and measures of the Metric system. The next step of importance consisted in the Colonial Premiers at the Coronation Conference passing a resolution in the following terms:—

“That it is advisable to adopt the Metric system of weights and measures for use within the Empire, and the Prime Ministers represented at this Conference to give consideration to its early adoption.”

In 1904 there was introduced in the House of Lords, and read a second time in that House, a Bill to render compulsory in Great Britain and Ireland the use of weights and measures of the Metric system. The Bill was then referred to a Select Committee. The Select Committee, presided over by the Lord Belhaven and Stenton, reported favourably on the Bill with amendments, but it was dropped for that year. It was, however, reintroduced in the House of Commons in 1907, but notwithstanding the fact that a petition, signed by over 16,000 people, was lodged in its favour, it was defeated by a majority of 32. This Bill, which so nearly met with success, was not promoted by the Government. It was, as any Bill on the subject ought to be, a non-party measure; Liberals, Unionists, Labour Members, and Nationalists mingled together in both lobbies.

The reasons urged for the rejection of the Bill were several in number, but speaking generally they were based on two considerations—the cost and the inconvenience of making the change. Wild estimates were submitted as to the cost which would be occasioned to the country or to particular industries, and an exaggerated picture was presented as to the inconvenience which the change would cause.

A section of the engineering trade were opposed to the Bill of 1907, but the strength and the nature of the opposition were, I believe, greatly exaggerated. It was said for example, that every machine, gauge, templet, rule and other device constructed with regard to existing measurements would have to be immediately put out of use, and that the changing of these would cost the engineers of our country an immense sum of money. The statements of many leading scientists and engineers who gave quite an opposite opinion could be quoted. The late Lord Kelvin was of opinion that the change to the Metric system would not involve the displacement of any useful machinery. The head of the well-known firm of Kynochs, Ltd., said that the cost was insignificant, and would probably be covered by the saving in clerical work. Sir Joseph Crossfield & Sons, Ltd., said :—"As a practical example, the Metric system has been adopted within our works." The late Sir Benjamin Baker, the eminent engineer, said :—"I am equally familiar with both systems in consequence of having carried out works abroad, and when I return to this country from such work and experience of the Metric system, I think there is nothing more foolish in the world than our weights and measures."

It may further be pointed out that supposing the Metric system were to-morrow rendered compulsory for use in buying and selling, that would not render illegal the use by an engineer engaged in construction work of a gauge or other device based on the inch and not on the centimetre. These devices could be gradually changed, and doubtless would be gradually changed, without much disturbance to the engineering trade.

The strongest opposition to the compulsory adoption of the Metric system came from the textile traders of Lancashire. The cotton trade in that country is a very extensive and important one. For example, in 1906 Lancashire exported cotton goods representing a value of something like £75,000,000, and that was only four-fifths of their production. The opposition from that source seemed to be of a two-fold character. In the first place it was stated that the 750,000 looms in use there would have to be replaced at a cost of something like 20/- or 30/- each. In the second place extensive tables known as the cotton trade wages list published in book form, which were said to have taken 50 years of time, and many thousand pounds to produce would, it was said, be rendered useless. This is a matter on which I will not venture

to express any opinion, but I call into the witness box Mr Ernest B. Fry, Shipley, Yorkshire, Consulting Textile Expert, and Examiner in Woollen and Worsted Spinning to the City and Guilds of London. Mr Fry said :—

“Some of the opponents of the Metric system instance the use of the English textile standards for counts, etc., in some of the Continental factories, and this has undoubtedly arisen because of the large proportion of English machinery in use in these factories, and the very large quantities of English yarn sent out to these countries, but this is a very poor reason for perpetuating these innumerable standards ; but, on the other hand, I know personally of instances here in which managers in the mills make the whole of their calculations on a Metric basis because of its simplicity, and then convert the results into English standards for use in the mills. There are also many warehouses in Bradford district where the Metric system has been in regular use for several years. A great deal too much is made of the supposed difficulty which would occur in making an alteration, but I am strongly of opinion that within a few months of its compulsory adoption it would be working with the greatest smoothness in nearly every case, but with far less cost in changing than its opponents make out.”

In support of Mr Fry's evidence, I also call Mr Rowlett, Ex-President of the Leicester Chamber of Commerce, and Examiner for the City and Guilds of London Institute, agent for yarn thread, who said :—

“The spinner objects that if he spun metric numbers he would have to alter his machinery at considerable cost ; but this is quite a fallacy. There is no difficulty in spinning half numbers and even quarter numbers, but there is an impossibility of spinning always exactly the same number, and this is so well recognised in the textile world that a variation of quarter number above or below equal to half number is always allowed. In spinning it is always possible, without any expense, to get within this margin of the metric count, and even, in many cases, to substitute the English one without any change. This proves that the difficulty of supplying metric numbers is only imaginary, and the remark applies to worsted, flax, etc., also. . . .

“The long suffering wait for the Metric system will, it is to be hoped, be materially shortened by the recent action of the East Indian buyers of silk and woollen yarns. Our conservative methods have cost this country nearly the whole of the custom of these gentlemen, and several of them now refuse to have anything to do with British goods unless the makers adopt the Metric system of counts. The Indian Government is, in consequence, considering the question of legalising the Continental system, and of getting British Manufacturers to adopt it.”

I shall now consider what appear to be the most common and the most pertinent class of objections to the compulsory adoption of the Metric system. I refer to the cost which the change would entail to shopkeepers and to the inconvenience which would be occasioned.

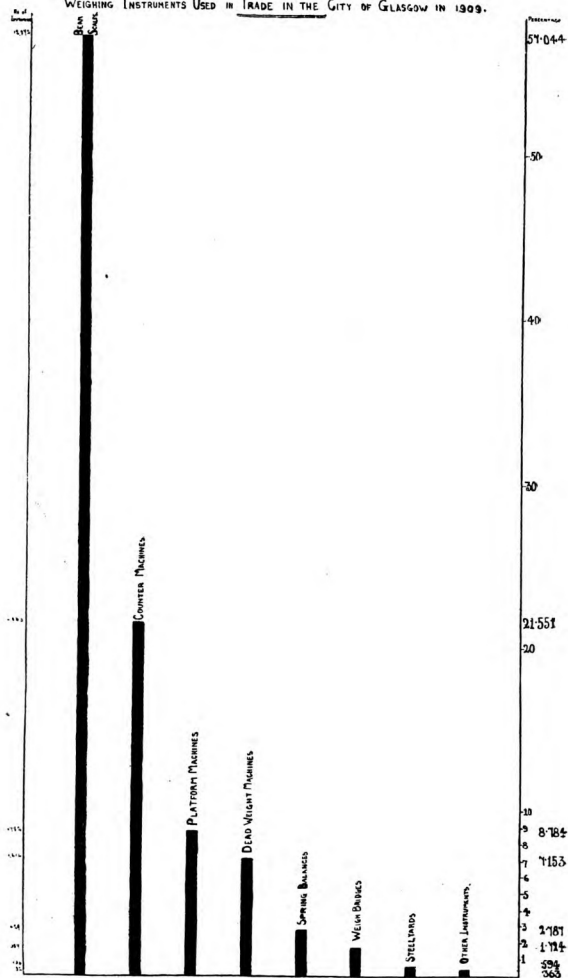
I begin with the cost. It was stated in the House of Commons by a responsible statesman, during the discussion on the Bill of 1907, that the change would cost the retail traders of this country about £2,000,000 sterling. Was that a mere haphazard guess? I did not read that the basis of the estimate was stated, and am inclined to think that the statement should not be taken seriously. After all, however, it is not of particular interest to a shopkeeper what the total outlay to all shopkeepers may be. "What shall it cost me?" is the question which interests the shopkeeper, and I propose to deal now with the matter chiefly from that point of view.

In estimating, I have chosen, as a convenient method of showing the importance or extent of any particular business with which I am dealing, to state the rental or annual valuation of premises, and I have been favoured with rental and other particulars from shopkeepers, and with prices and estimates from reliable firms dealing in weights, measures, and weighing appliances.

Reference to the draper may almost be omitted. To replace his measures of length would mean an infinitesimal addition to his outlay. In a drapery business in one of the districts of the city where the annual rental of premises is £100, it would cost the draper less than 10/- to replace in metric measures the measures of length which he at present finds necessary. I do not propose to give another example with regard to measures of length.

Take next shopkeepers and others who use measures of capacity. In this case also the outlay would be comparatively small. By far the greater number of measures of capacity used are in wine and spirit shops. There the old and more expensive pewter measure is almost a thing of the past. Glass measures which are cheap, and which usually have a short business career, are the most common measures in use. To a much lesser extent, earthenware and iron enamelled measures are used. On the other hand the most expensive class of milk measures could be easily altered to measure in metric denominations. The measure is defined by graduated metal strips, soldered to the inside of the vessel, and these strips could be replaced at small cost by strips graduated in

GRAPHIC REPRESENTATION OF THE PROPORTION OF DIFFERENT CLASSES OF
WEIGHING INSTRUMENTS USED IN TRADE IN THE CITY OF GLASGOW IN 1909.



the Metric system. I therefore propose not to further consider measures of capacity, but to proceed at once to the more important question of the cost of weights and weighing appliances.

Great misunderstanding probably exists as to the cost which the change would entail in weighing instruments. I submit a graphic representation of the proportion of weighing instruments of the various descriptions which were in use for trade purposes in the City of Glasgow during 1909.

There were in trade use in the city during last year 22,565 weighing instruments, divided as follows :—

12,872	Beam Scales, -	-	or 57·044 per cent.
4,863	Counter Machines, -	-	or 21·551 „
144	Steelyards, -	-	or 0·594 „
629	Spring Balances, -	-	or 2·787 „
1,614	Dead weight Machines, -	-	or 7·153 „
1,982	Platform Machines, -	-	or 8·784 „
389	Weighbridges, -	-	or 1·724 „
82	Other Instruments, -	-	or 0·363 „

It is obvious that Beam scales (Fig. 1),¹ Counter machines (Fig. 2), and Dead Weight machines (Fig. 3) would not be affected

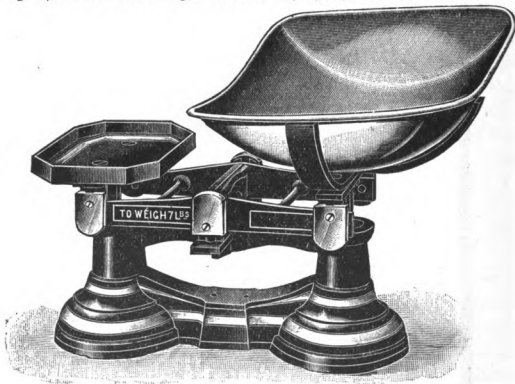


FIG. 2.

¹ It has not been deemed necessary to include here Figures 1, 5, 6, 7 and 8, Figure 1 being the ordinary beam scale, while Figures 5, 6, 7 and 8 were the same in principle as Figure 4, except that dials in Figures 7 and 8 take the place of steelyards.

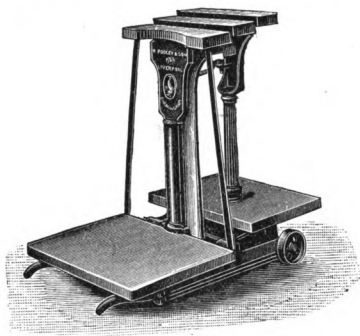


FIG. 3.

in any way by a change to the Metric system. These three classes numerically constitute 85.748 per cent. of the weighing instruments in use for trade in the city.

Other two classes—Platform Weighing machines (Figs. 4 and 5), and Weighbridges (Figs. 6 and 7), which together constitute 10.508 per cent. numerically, would have to be slightly reconstructed. The steelyard or dial would in every case have to be replaced or remarked. The same remarks apply to Pit Bank

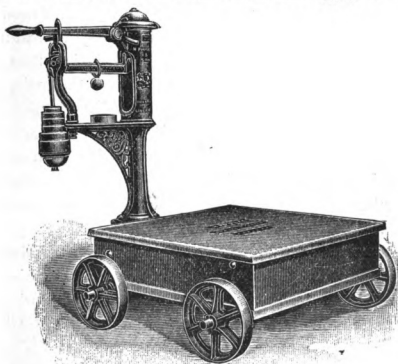


FIG. 4.

machines (Fig. 8). In estimating the cost of such alterations, the well known firms of Messrs Henry Pooley & Sons, Ltd., and Messrs W. & T. Avery, Ltd., very generously responded to my request for advice. With the help of these firms I estimate as shown in the following table :—

Table showing the estimated cost of changing certain types of weighing instruments to weigh according to the Metric instead of the Imperial system.

Capacity and Type of Weighing Instrument.	In an instrument fitted with steelyard to replace the steelyard :—		In a dial machine to replace the dial.	To re-mark the dial.	In an instrument fitted with steelyard to re-mark the steelyard.
	In a no-loose weight machine.	In a loose weight machine.			
10 Ton Weighbridge,	£12 0 0	£7 0 0	£13 0 0	£3 0 0	£2 0 0
	to	to	to	to	to
1 Ton platform Weighing Machine,	£14 0 0	£9 0 0	£15 0 0	£4 0 0	£3 0 0
	to	to	—	—	to
5 Cwt. platform Weighing Machine,	£4 0 0	£2 0 0	—	—	£1 5 0
	to	to	—	—	to
	£3 10 0	£2 0 0	—	—	£1 0 0
	to	to	—	—	to
	£4 10 0	£2 10 0	—	—	£1 10 0
	to	to	—	—	to

In the case of weighbridges fitted with steelyards of modern type, re-marking would be all that would be necessary in most instances. I shall give an example. Take a weighbridge of 10 tons weighing capacity weighing by half ton graduations on the main steelyard and by divisions of the half ton on a subsidiary bar. In such a machine no alteration would be required in the graduations of the main steelyard. A slight deduction of what is known as the main carriage weight, and a complete alteration of the subsidiary bar (which could be done at small cost) would constitute the requisite alterations.

Of the remaining weighing instruments, Spring balances (Fig. 9) constitute 2·787 of the instruments in trade use in the city. While it would be quite possible to reconstruct a Spring balance denominated in the Imperial system to weigh in the Metric system, yet, in view of the comparative small cost of a new spring balance and the short business life of such an instrument, that course is not likely to be followed. Steelyards (Fig. 10) would also go to

the scrap heap, and so also would certain special forms of instruments classified as "other instruments," constituting 0·363 per cent. of the instruments in use in Glasgow.



FIG. 9.

We thus find that, of the weighing instruments in use in commercial transactions in Glasgow, only 3·714 per cent. would be rendered useless, 10·508 per cent. would require reconstruction, and 85·748 per cent. would not be affected, in the event of a change to the Metric system of weights and measures being made compulsory.

I now consider the weights used with beam scales, counter machines, and dead weight machines. These would have to be replaced by weights of the Metric system.

In estimating the cost here, a great deal depends on the kind of weighing equipment which a shopkeeper possesses. It is of importance, for example, to notice whether the shop is equipped with brass or iron weights, as a new set of brass metric weights corresponding to those from 4 pounds to $\frac{1}{4}$ ounce would cost about 25/-, whereas a new set of iron metric weights corresponding to those

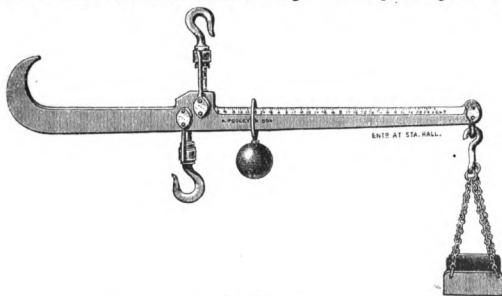


FIG. 10.

from 28 pounds down to $\frac{1}{4}$ pound would cost only about 12/- . In the few estimates which I submit I have made reasonable allowance also for depreciation of value and for the sale of the disused material. My estimates are as shown in following table :—

Table showing the estimated cost to traders of a change from the imperial to the metric system in several instances in the city.

TRADER.	Annual Rental.	Cost of Change.	Cost as compared with Annual Rental.	District of City.	REMARKS.
Tobacconist,	£60 0 0	£0 5 6	$\frac{1}{2}$ per cent.	Non-Central	{ In this case the weighing equipment is exceptionally costly, and the cost of the change would therefore be exceptionally great. { The higher proportion or cost in these cases is due to a steelyard in each instance forming part of the equipment.
Confectioner,	40 0 0	0 8 0	1 per cent.	Do.	
Hardware Merchant,	45 0 0	0 9 0	1 per cent.	Do.	
Fish Dealer,	32 0 0	0 16 0	$2\frac{1}{2}$ per cent.	Do.	
Fruit and Vegetable Dealer,	90 0 0	1 10 0	1·7 per cent.	Central	
Do. do.,	1300 0 0	26 0 0	2 per cent.	Do.	
Do. do.,	28 0 0	1 16 0	$5\frac{1}{2}$ per cent.	Non-Central	
Butcher,	50 0 0	3 8 0	6·8 per cent.	Do.	
Do.,	35 0 0	3 8 0	10 per cent.	Do.	
Grocer and Provision Merchant,	400 0 0	5 4 6	$1\frac{1}{4}$ per cent.	Central	
Do. do.,	500 0 0	8 10 0	1·7 per cent.	Do.	
Do. do.,	90 0 0	6 6 0	7 per cent.	Non-Central	
Do. do.,	40 0 0	3 10 0	8·6 per cent.	Do.	

It will thus be seen that the proportionate extra outlay to a shopkeeper would be an exceedingly varying quantity. This is due to the varying character of different shopkeepers' equipment, and to that most important of all conditions—the rental—which again is chiefly regulated by size of premises and locality. It will be seen, however, that the outlay to some shopkeepers would be a considerable item. Of course that outlay would be rendered less burdensome by spreading it over two years. It is, however, a relevant question to ask whether the shopkeeper should be required to bear the whole or only a proportionate part of the extra outlay occasioned by the introduction of the Metric system. It would seem to be a fairer arrangement if the general taxpayer were required to bear his fair share of such an outlay.

From the point of view of cost, and especially with regard to the task of familiarising buyer and seller with the Metric system, the period of transition is of importance. The most recent Bill which was discussed and met its fate on the 22nd March, 1907, proposed that on and after 1st April, 1910, or such later date as might be fixed by a postponing order, the kilogram and the metre should become the imperial standards of weight and measure. That meant a period of transition of 2 or 3 years, and it gave power to the Executive Government to extend the period if necessary. That seems to me to have been a very reasonable proposal. If this period of transition were made too short it would tend towards a temporary swelling of prices. In addition, 2 or 3 years would give shopkeepers time to adjust prices to suit the new system, and it would afford time for the two systems being used concurrently in shops for a brief period.

It would further tend towards the silencing of opposition and the lessening of inconvenience if the Executive Government had the power to extend the period of transition, if deemed advisable with regard to certain trades. Further it would, in my opinion, be advisable to adopt the whole of one of the recommendations of the Select Committee of the House of Lords in 1904. That Committee recommended that a clause to the following effect should be added to the Bill then before them :—

“ Provided that nothing in this Act shall—

- (a) Affect any contract made before the commencement of this Act ; or
- (b) Render void any contract or dealing with any person outside the United Kingdom on the ground that the weights and measures ex-

pressed or referred to therein, are not weights and measures of the Metric system ; or

(c) Affect or apply to the linear or superficial measurement of land ; or

(d) Apply to any trade or business which may for the time being be exempted from the operation of this Act by an Order in Council made for that purpose."

To go further in the direction of exempting certain trades than indicated in the foregoing recommendation would not, I think, be desirable. It was suggested, for instance, when the last Bill was before Parliament that the textile and engineering trades should be exempted. But many leading men connected with these two trades have expressed themselves in favour of the change. Therefore, if an Act were passed making the system compulsory within a certain period of time, with the proviso to which I have referred, it would doubtless be found that many firms connected with these two industries would, on the passing of the Act, take immediate steps towards introducing the system in their business.

I shall now deal briefly with the important question of the steps to be taken to familiarise the public with the Metric system of weights and measures. Of course the most important of such steps has been in operation for a number of years. I refer to the teaching of the system in schools. The Select Committee of 1895 recommended among other things :—

"That the Metric system of weights and measures be taught in all public elementary schools as a necessary and integral part of arithmetic, and that decimals be introduced at an earlier period of the school curriculum than is the case at present."

That recommendation has, I understand, been put into practice. Yet it cannot be doubted that a great proportion of our people are quite ignorant of the system, and that even those who mastered the system at school are not sufficient familiar with it to-day. In that connection another of the recommendations of the Select Committee of 1904 should be adopted. That recommendation was in the following terms :—

"The Board of Trade shall take such steps as they think expedient for giving publicity to the date of the commencement of this Act, and for facilitating, as far as possible, the transition from the system of weights and measures in force at the commencement of this Act to the Metric system, and it shall be the duty of all persons to obey any directions given by the Board of Trade for that purpose."

We ask—"What shall these steps be?" In that connection the work of stating equivalents has already been very fully and

very simply carried out for commercial and technical purposes by "Nelson Folley" in the book which I hold in my hand. Thousands upon thousands of equivalents are given suitable for all purposes. It would be a very simple matter to reprint on cardboard the equivalents necessary for the education of both buyer and seller, and to have these exhibited in shops and other places under the direction of the Board of Trade. In that way the task of educating the public could be easily solved.

In conclusion, may I say that the subject is such a large one that I have had to be brief. I have not referred to the numerous public bodies who have time after time passed resolutions in favour of the compulsory adoption of the Metric system, nor to many strong expressions of opinion of eminent men who condemned in unmeasured terms, our absurd system, and gave unstinted praise to the Metric system. Volumes could be written thereon. The one unfortunate circumstance about the early history of the Metric system is that it was proposed by France to Great Britain at a time when any proposal, however good, made by the Emperor of France to the King of Great Britain, had to overcome an immense weight of antipathy. That time has now receded from view, and in its place we have the *entente cordiale*. If I have done anything by this paper to increase interest in and sympathy towards the Metric system, my object shall have been achieved.

On an Improved Form of Electric Furnace for use in Magnetic Testing. By JAMES G. GRAY, D.Sc., F.R.S.E., Lecturer on Physics in the University of Glasgow, and ALEXANDER D. ROSS, M.A., B.Sc., F.R.S.E., Assistant to the Professor of Natural Philosophy in the University of Glasgow.

[Read before the Mathematical and Physical Section,
15th March, 1910.]

IN connection with their new form of magnetometer¹ for testing magnetic materials at different temperatures, the authors have designed an electric furnace for use within the magnetising solenoid of the apparatus. Several alterations have been introduced in it from time to time in order to render it more suitable for certain specific purposes. The arrangement described in the present paper represents the form finally evolved; it will be found to embrace several new features, and to be adapted to the varied requirements of magnetometric investigations.

The chief requirements which must be satisfied by such a furnace may be summarised as follows:—(1) it must be capable of being used within the magnetising solenoid; (2) the heating current must be so supplied as to produce no observable effect in the neighbourhood of the magnetometer needle; (3) the temperature must be uniform to within a few degrees over the full working length of the furnace; (4) the furnace must be available for all temperatures extending from ordinary room temperature to that of the highest critical points of magnetic materials (nearly 900° C.); (5) provision must be made for bringing the temperature accurately to any desired value; (6) alteration of the temperature from one value to another must be effected, when so required, without loss of time, in order that ageing may be avoided in unstable materials; (7) arrangements must be provided for registering directly and accurately the temperature of the specimen under test; (8) precautions must be taken to prevent any chemical action, such as

¹ Proc. Roy. Soc. Edin., xxix., p. 182 (1909); Phil. Mag., Ser. 6, Vol. xviii., p. 148 (July, 1909).

oxidation, from affecting the constitution of the material under test.

The last mentioned requirement is one which is only indifferently satisfied, or not at all, by the majority of furnaces now in use. The method generally adopted consists in displacing the air in the furnace by an inert gas such as hydrogen or nitrogen. If hydrogen is employed the method has the disadvantages that some metals occlude a considerable quantity of hydrogen with a resultant slight change in their properties, and that the use of an inflammable gas in a furnace requires careful and constant attention. Nitrogen again cannot be easily and readily prepared as required. Its use in iron storage cylinders is objectionable, unless they are placed at a very considerable distance from the magnetometer.

The details of the furnace which the authors have found, as the result of many trials, to be most suitable, will be understood from Fig. 1. AA is an unglazed porcelain tube made at the Königlische Porzellan Manufaktur, Berlin; it is 38 cms. in length, 2.35 cms. in internal diameter, and slightly under 2 mms. in thickness. Upon this tube is wound 23 metres of platinum wire of No. 27 S.W.G. The winding BB is double; the current in adjacent turns circulates in opposite directions around the tube, with the result that there is no magnetic field produced at any point by the heating coil. The correct spacing of the turns is a matter of difficulty, and can only be arrived at by trial. Owing to the conduction of heat from the centre of the furnace to the ends it is necessary for the windings to be much more closely spaced near the ends than at the centre. If the specimens to be tested are 20 cms. in length, the heating coil ought to extend over a length of at least 30 cms. With proper care the irregularities in temperature over the central 20 cms. should not exceed 5° C. when the furnace is at a red heat. These slight temperature differences are reduced by a stout cylinder of pure copper placed within the porcelain tube, and the effect of the remaining irregularities is further lessened by the conductivity of the test-bar itself and of the copper wrapping (described below) in which it is enclosed.

The furnace is placed within a tube CC of Jena glass (60 cms. long for use with a 40 cms. magnetising solenoid), and the space DD is tightly packed with dry kaolin clay, which has been fused and powdered. This treatment of the clay is advisable in order to expel all moisture, and to prevent shrinkage of the material after

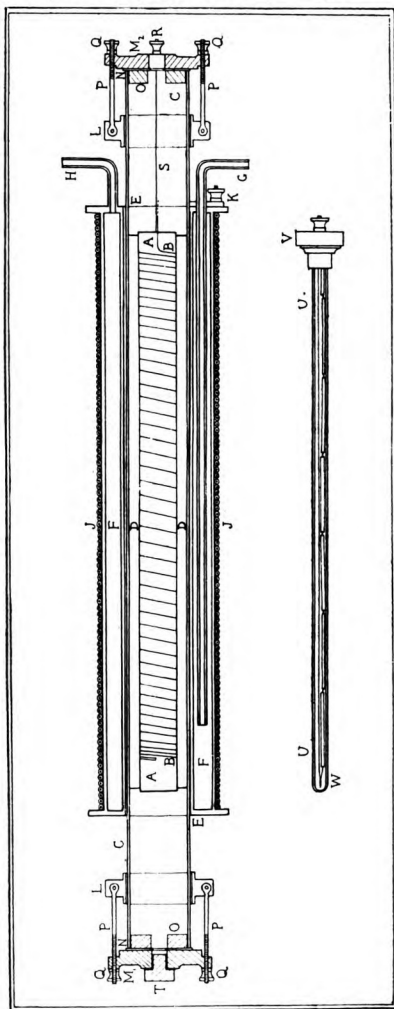


FIG. 1.—SECTION OF THE FURNACE.

PLATE V.

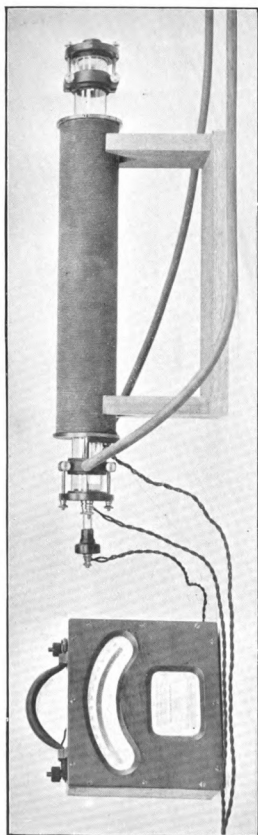


FIG. 2.

MAGNETISING SOLENOID, FURNACE
AND VOLTMETER,

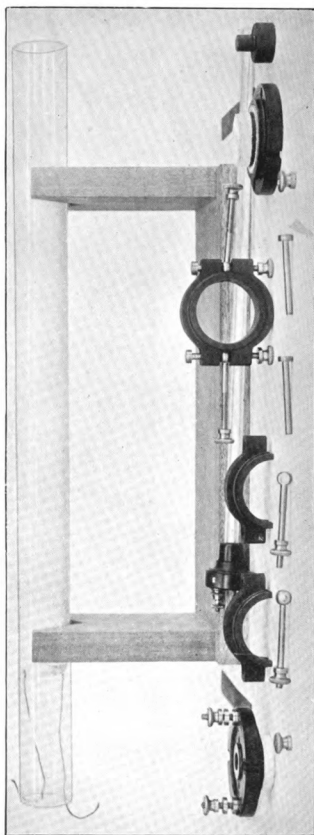


FIG. 3.

FURNACE, SHOWING DETAILS OF
CONSTRUCTION.

the furnace is put into use. The kaolin clay (which may be replaced if desired by powdered quartz) performs the double duty of supporting the furnace and of preventing the coils of platinum wire from changing their positions when expanded by heat. The packing of dry clay is retained in place by a few turns of pure asbestos string.

The Jena glass tube is of such a diameter as to admit of its fitting closely into the inner brass tube of the magnetising solenoid EE. In the figure the Jena tube and solenoid are shown in section. FF is a water jacket about 1 cm. in thickness, and is provided with an inlet (G) and an outlet (H), for maintaining an efficient circulation of water. A supply of 200 ccs. of water per minute is ample even when the furnace is raised to 1000° C. JJ indicates one of the layers of wire on the solenoid; four such layers of No. 15 S.W.G. d.s.c. copper wire are used on the Gray-Ross magnetometer. K is one of the terminals of the solenoid; these terminals are mounted on a block of ebonite.

The Jena tube extends some 10 cms. beyond the solenoid on each side. At about 5 cms. from either end are attached rings of vulcanite LL. These rings are built in two semicircular portions bound together by brass bolts and nuts (this construction will be more clearly seen in the photographs, Figs. 2 and 3). A thin strip of rubber or sheet asbestos is placed between the vulcanite and the glass. The rings are employed to hold circular vulcanite caps M_1M_2 over the ends of the glass tube. The caps have each a central hole 1.1 cms. in diameter. The face which is turned towards the furnace is covered with a thin sheet of rubber NN, and this is protected from the hot air in the furnace by a thick layer of asbestos OO, which is made of such size as just to fit within the Jena tube. Three brass screws bind the asbestos, rubber, and vulcanite together and provide an easy means of replacing the rubber when it has deteriorated with the heat. The vulcanite caps are each tightly drawn against the ends of the glass tube by two brass arms PPPP, hinged on the jointing bolts of the rings LL, and provided with clasping screws QQQQ. One of the caps M_2 is in addition provided with two terminals (one being shown at R), which are attached to the ends of the platinum-heating wire by copper leads S. The other cap M_1 is readily detachable for the purpose of inserting or removing the test specimens.

When the furnace is in use the pyrometer UU is inserted through

the opening in one cap while the other aperture is tightly closed by the plug T of ebonite which is accurately turned to fit the opening.

The pyrometer consists of a tube UU of fused silica (or quartz) closed at one end. The other end is fitted with a vulcanite head V on which are mounted two binding screws. These latter are attached to the platinum and platinum-iridium wires of a thermocouple, the wires being fused together at the junction W. One of the wires is surrounded by a series of short tubes of fused silica which effectively insulate it from the other. The e.m.f. of the junction may be measured by means of any convenient millivoltmeter. The junction has then to be standardised by tests of known fusion and boiling points; the following are very convenient for this purpose:—

Boiling Point of Water at Normal Atmospheric

Pressure, -	-	-	-	-	-	100° C.
Melting Point of Tin, -	-	-	-	-	-	227° C.
Melting Point of Lead, -	-	-	-	-	-	326° C.
Boiling Point of Sulphur at N.P., -	-	-	-	-	-	444·4° C.
Melting Point of Aluminium, -	-	-	-	-	-	654° C.
Melting Point of Silver, -	-	-	-	-	-	945° C.

A convenient method of recording the temperature is to employ an ordinary d'Arsonval mirror galvanometer with a large and variable resistance connected in series with it. The scale is then set up so that the indicating spot of light is at say 7·5 mms., when the thermo-junction is at 15° C. (room temperature). The junction is then heated to the temperature of melting aluminium (654° C.) and the resistance altered until the scale reading is 327 mms. Any reading x mms. on the scale then corresponds closely to a temperature of $2x$ degs. C. An accurate calibration curve must of course be constructed, but this simple approximate relation will be found extremely convenient in practice.

The following procedure is adopted to guard against oxidation effects in the furnace. The test specimen (usually in the form of a cylindrical rod about 20 cms. $\times$ 1 cm.) is wrapped in three or four layers of pure electrolytic thin sheet copper. The copper wrapping, which projects beyond the ends of the specimen, is pressed flat and then coiled up. The specimen is placed in

position in the furnace, the pyrometer and vulcanite plug inserted, and the current in the heating circuit started. As the temperature mounts the air contained in the furnace tends to expand. When the internal pressure rises to a value slightly above atmospheric, the air forces its way out between the somewhat tightly fitting rubber washer L_2 and the pyrometer tube, and so the pressure ceases to increase. When a red heat is attained the oxygen present commences to combine with the copper foil. The pressure steadily diminishes as the oxygen is removed, and when it has fallen somewhat below atmospheric pressure, fresh air enters at the rubber washer. The oxygen of this new supply is in turn fixed, and so the process continues until the interior contains only inert gas. The tightness of the washer prevents exchanges between the inside and outside atmosphere when the temperature is kept constant, and hence the small amount of copper foil mentioned is sufficient to take up all the oxygen. This method has proved very efficient. The innermost layer of copper foil has been found quite unacted on after annealing processes lasting over several days, and chemical examination of the specimens has testified to the thoroughness of the protection afforded them.

An obvious alternative to the foregoing procedure would be to electro-plate the specimens with copper. This would of course prevent all oxidising action in the furnace. The process, however, is troublesome, and the immersion of the specimens in a plating bath would in most cases be almost as objectionable as the atmospheric action which has latterly to be guarded against.

The regulation of the temperature of the furnace may be effected by altering the voltage of the current source (if a large storage battery is available), or by using a variable resistance (say a number of incandescent lamps arranged in parallel, if a town electric supply is employed). In either case a few preliminary tests will give an idea of the arrangement necessary to give any desired temperature. From 170 to 180 volts will give a temperature of about 850° C. with a current of less than 4.5 amperes. Higher temperatures to 950° can be obtained with increased voltage, but at about this latter point arcing is apt to take place between adjacent turns at the supply end of the winding. When temperatures of 900° and above are used a fuse must be included in the circuit fittings.

The furnace as described contains slightly over 2 ozs. troy of

platinum wire which, at current prices, costs about £10 18s. od. Adding on the expense of the other parts, the furnace material costs about £11 10s. od., exclusive of workmanship. The materials of the pyrometer described amount to a further £1 14s. od. (exclusive of the voltmeter). It should be observed that more than 90 per cent. of the expense is in the platinum and platinum-iridium wires, which are of permanent value and will always realise a considerable part of their initial cost.

Aluminium Bronzes. By ROBERT C. GRAY, Houldsworth Research Scholar, University of Glasgow.

[Read before the Mathematical and Physical Section,
15th March, 1910.]

IN February of last year a paper on "Magnetic Bronzes¹" was read before this Section, giving an account of tests which had been carried out by Mr A. D. Ross and the author on various alloys of copper, manganese and aluminium. As a result of these investigations we were led to suggest the possibility of the peculiar properties of the Heusler alloys being due to the formation of solid solutions of the compound Cu_3Al with copper and manganese.² In a paper³ published last autumn we adduced further evidence in support of our hypothesis, based on tests which had been carried out on certain aluminium bronzes. Shortly after our hypothesis had been brought forward, Heusler and Richarz⁴ advanced a theory of the Heusler alloys, in which the magnetism was accounted for by the supposed occurrence of a series of chemical compounds of the general type $\text{Cu}_x\text{Mn}_y\text{Al}_z$, where x and y may have any of the values 0, 1, 2, 3, . . . , and $x + y = 3z$. These experimenters consider that any alloy whose constitution can be represented by such a formula is rendered less magnetic by the addition to it of a further quantity of any one of the metals.

The recently published Ninth Report of the Alloys Research Committee,⁵ which deals with a limited section of the copper-aluminium-manganese system, draws special attention to the fact that no evidence was found of the formation of any ternary compounds (such as were postulated by Heusler and Richarz) within the limits of concentration investigated, nor any indication of the

¹ Ross and Gray, Proc. Roy. Phil. Soc. Glas., xl., p. 94. (1909.)

² See also, Ross and Gray, Proc. Roy. Soc. Edin., xxix., p. 274. (1909.)

³ Ross and Gray, Zeit. f. anorg. Chemie, 63, p. 349. (1909.)

⁴ Heusler and Richarz, Zeit. f. anorg. Chemie, 61, p. 265. (1909.)

⁵ Rosenhain and Lantsberry, Proc. Inst. Mech. Eng. (1901.)

existence of such compounds within the vicinity of this region. Rosenhain and Lantsberry, on the other hand, find Cu_3Al and manganese in solid solution, and similar solid solutions have also been shown¹ to occur of Cu_3Al with copper and with aluminium.

Last summer, at the suggestion of Mr Ross, I began a detailed examination of the binary copper-aluminium system. The object of the investigation was not only to secure general information as to the magnetic properties of this most important series of alloys, but to throw some light on three particular points :—

- (1) In what way and to what extent are the magnetic properties of copper-aluminium compounds affected by their entrance into solid solutions with one another and with the free elements ?
- (2) What are the magnetic properties of solid solutions containing Cu_3Al as one constituent, and how are they modified by thermal and other treatment ?
- (3) Do magnetic tests give any evidence as to the existence or non-existence of a compound Cu_4Al , which has been reported by some investigators ?

The scheme of work was as follows :—

- (1) To prepare and analyse chemically a large series of copper-aluminium alloys ;
- (2) to test the residual magnetism and magnetic permeability of the materials in various conditions ; and
- (3) to examine the microstructure of the alloys in so far as it is related to the magnetic behaviour.

This scheme involves a great amount of laborious working. So far the research has advanced satisfactorily. Thirty-seven alloys have been prepared and analysed, all of them lying in the copper-rich portion of the series with less than 35 per cent. of aluminium. Their residual magnetism in the annealed condition of the material has been investigated, and the results have been thought interesting enough to warrant this preliminary paper on the work.

The alloys have been prepared from pure electrolytic sheet copper and pure aluminium ingots. In view of the expense the

¹ Curry, Journ. phys. Chem., 11, p. 425. (1907.)

amount of metal available for each casting was necessarily small, being about 120 gms. on the average. To secure thoroughly homogeneous castings with such a small allowance of material, it was found necessary to make a second and sometimes a third casting, the preparation of a single alloy thus extending over several days. The copper was melted in a small blow-fire in covered Salamander crucibles, and the aluminium added, every precaution being taken to avoid oxidation of the metal. The rods were cast vertically in dry sand, and the specimens for the magnetic tests, measuring about 8 cms. $\times$ 0.7 cms., were sawn out from the centre of the rod. Two small pieces were also cut off from the rod adjoining the ends of the test specimen and were chemically analysed. The copper content was estimated either by the Mansfield (or Steinbeck) process, viz., the titration of an alkaline ammoniacal solution with potassium cyanide, or by the addition of potassium iodide and titration of the liberated iodine with sodium thiosulphate. Check analyses were in all cases carried out. In general the variation in composition of the test specimen is less than 0.5 per cent. throughout its entire length.

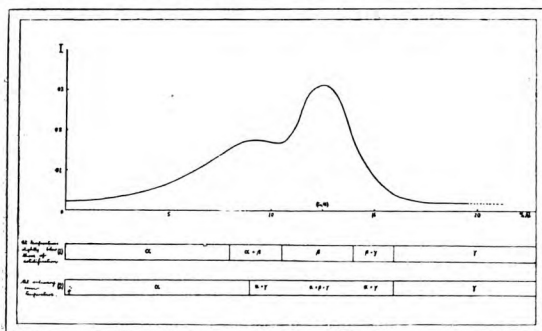
The specimens of the alloys, deeply imbedded in kaolin clay to prevent oxidation, were baked in an electric oven for one or two days at a temperature slightly below that of the "solidus" or of the lowest transformation. They were then slowly cooled to avoid any straining of the material. I am much indebted to Dr Desch, of the University Metallurgical Department, for carrying out this annealing process for me in his electric resistor furnace.

For examination of the permanent magnetism, the annealed specimens were placed in a field of about 5000 C.G.S. units between the poles of a large electromagnet; and the residual magnetic moment was measured by a very delicate magnetometer recording on a scale about $2\frac{1}{2}$ metres distant.

The diagram gives a general view of the results which have been obtained, and of the deductions to be made from them. In the lower portion has been entered the constitution of the alloys when in a stable condition (1) at temperatures only slightly below that of solidification, and (2) at ordinary room temperature. Alloys which have been chill-cast will approximately conform to (1), while those which have been annealed for prolonged periods at a moderate temperature will have more or less nearly the constitution specified in (2). The data given in (1) and (2) are based

on the investigations of Curry and of Carpenter and Edwards, referred to above, and may be taken as the most accurate information at present available.

In discussing the alloys prepared in the present research, the thermal treatment which they have received must be kept prominently in view. The transformations which occur in the alloys in the solid condition take place with extreme slowness. Thus Curry states that in alloys with about 12 per cent. Al, 30 days annealing at 500° C. was required to completely eliminate all trace of the β -phase (Cu_3Al). Even after 20 days annealing it was easily



β is Cu_3Al . α and γ are solid solutions of aluminium in copper.

discernible with the microscope. In consideration then of the much shorter annealing which these alloys have received, the following will probably represent their constitution with comparative accuracy :—

- (a) From 0 to 9 per cent. Al, the alloys consist of solid solutions α of aluminium in copper.
- (b) From 9 to 16 per cent. Al, the alloys contain both α and γ .
- (c) From 16 to 27 per cent. Al, the alloys consist solely of the solid solution γ .

Alloys lying within the range (b) will contain to some extent traces of Cu_3Al . In alloys which belong to the extreme regions of the range the amount of the compound present will be negligibly

small, but in those with from 11 to 14 per cent. Al, the amount will be of importance, especially if (as will be shown to be the case) the compound possesses characteristic properties. The maximum amount of Cu_3Al will be found in alloys with about 12.5 per cent Al.

The curve of permanent magnetism rises gradually with increase of Al from 0 to 9 per cent., droops from 9 to 10.5 per cent., then mounts steeply to a maximum at 12.5 per cent., after which it falls off rapidly to a value little above zero at 16 per cent. Al.

This behaviour may be satisfactorily explained as follows:—The solid solutions α are magnetic, and show increasing retentivity with increasing aluminium content. From 9 to 10.5 per cent. the curve droops owing to the increasing amount of γ present. γ (as is shown by the curve beyond 16 per cent.) has practically no magnetic retentivity, and its occurrence in alloys with 9 to 10.5 per cent. Al reduces the permanent magnetism by its diluting effect on the α -solution. Possibly it may actively reduce the magnetism of α , but there is no direct evidence for this, and it seems more probable that its part is merely passive. With alloys containing 10.5 to 15 per cent. Al the presence of the compound Cu_3Al becomes of paramount importance. The compound exhibits comparatively high retentivity, and hence the curve attains a well-marked maximum at 12.5 per cent. Al. From that point onwards the diminishing amount of Cu_3Al and the increasing proportion of the non-magnetic γ -solution render the alloys of decreasing retentivity.

I have to express my indebtedness to Professor Gray for many privileges granted for the work in the laboratory here; and also to Mr A. D. Ross, at whose suggestion the work was begun, for his guidance and assistance.

The Variation with Temperature of the Magnetic Properties of a High Carbon Steel. By MARGARET B. MOIR, M.A., B.Sc., Carnegie Scholar, University of Glasgow.

[Read before the Mathematical and Physical Section,
15th March, 1910.]

THE most notable investigations carried out on the magnetic properties of materials at temperatures higher than normal room temperature are those of Hopkinson¹ and Morris.² The experiments of Hopkinson extended to iron, to various steels, and to nickel. The specimens examined were in the form of rings. Each ring was wound with primary and secondary coils to allow of its magnetic properties being investigated by Rowland's well-known method of reversals. The procedure in each case was as follows: The ring was first heated up above the so-called critical temperature of the material, and allowed to cool to a temperature at which it was desired to submit it to test; the temperature was then arrested, and the specimen tested. It was next submitted to the action of an alternating magnetic field of gradually diminishing strength, a process which rendered the specimen devoid of magnetism and of magnetic history. In what follows this process will be referred to as "the process of reversals."

The temperature was now allowed to fall by a suitable amount, and the specimen was again tested as before.

In this way a series of observations was made at descending temperatures.

It is to be carefully noticed that the specimen was submitted to the process of reversals following upon each test. Thus a change in temperature intervened between each series of tests and the previous application of the process of reversals.

It is not generally known that purely thermal treatment (such as that involved in annealing), no matter what temperature is

¹ Trans. Roy. Soc., clxxx., p. 443. (1889.)

² Phil. Mag., xlv., p. 213. (1897.)

reached in the process, develops in the specimen a peculiar state which renders additional precautions necessary. This fact has been disclosed in experiments carried out by Gray and Ross.¹ These experimenters have shown that an alteration of the temperature of a specimen produces what they have called a "Sensitive State" of the material.

Thus, let a specimen of iron at any temperature be submitted to the process of reversals, so as to render it neutral, and let the temperature then be altered to any other value, higher or lower. If the specimen be now put through a magnetic test it will exhibit properties characteristically different from those which it shows on being retested after a repetition of the process of reversals. It will be found (1) that the initial magnetisation curve yielded by the first test always lies above that yielded by the second, the difference being most marked for low fields, and (2) that in the first test the hysteresis loop corresponding to a cyclic variation of the magnetising force between the limits $\pm H$ is not closed, and is decidedly unsymmetrical. In order, therefore, to obtain the true magnetisation curves for any material corresponding to any particular temperature, it is necessary, *once the temperature has been established*, to submit the specimen to the process of reversals previous to carrying out the test.

At the beginning of the present session the author commenced the investigation of the magnetic properties of a graded series of steels at various temperatures. The object of the research was to find the influence of varying carbon content on the temperatures at which the permeability of steel attains maximum and minimum values. Morris has shown that in the case of pure iron, permeability-temperature curves for low fields exhibit several irregularities which correspond with the recalcence points and with changes in the structure of the metal. In steels containing a considerable quantity of carbon these points of maximum and minimum permeability undergo extensive alteration. It would seem, therefore, to be of interest to study those changes in relation to the structural transformations which are disclosed by the microscope. For this purpose a series of carbon-steels has been obtained from Messrs Armstrong, Whitworth & Co. Ltd., together with specimens of very pure soft iron for comparison. These steels

¹ Proc. Roy. Soc. Edin., xxviii., p. 239 and p. 615. (1908.)

form a suitably graded series from mild steel, through medium carbon, to high carbon steel and cast iron. The specimens, which, after being cast, were forged and rolled, have all been cut to a standard size of 20 cms. in length by 1 cm. in diameter. The tests have been carried out on a Gray-Ross Magnetometer¹ fitted with the newest type of electric furnace,² and in the work the necessary precautions discussed above have been closely observed. Previous to the commencement of a test the steel rod is annealed at 900° C. in a Fletcher gas furnace, care being taken to prevent oxidation of the specimen.

The procedure is then as follows. The magnetometer having been adjusted, the test bar is placed in position within the electric furnace in the solenoid. By means of the furnace the specimen is brought to the desired temperature. It is then submitted to a process of reversals and a magnetic test, the temperature being maintained constant throughout the operations. The temperature is now changed to a new value, and the procedure repeated. In this way a series of magnetisation curves is obtained, characteristic of the specimen at various temperatures intermediate between room temperature and the critical temperature of the material under examination. From these curves it is of course possible to construct susceptibility-temperature or permeability-temperature curves for the material corresponding to various definite values of the magnetising force.

It is proposed to give in this paper the results which have been obtained in the case of a high-carbon steel. This material, which contains about 1.64 per cent. carbon, consists of cementite and pearlite. Tests have been carried out (1) for high fields, (2) for moderately low fields, up to about 10 c.g.s. units, and (3) for very low fields, that is, up to 1 c.g.s. unit.

Fig. 1 gives a series of I-H curves for various values from room temperature up to near the critical point. For a moderate increase in temperature, say from 15° to 300° C., there is very little change in the saturation value of I. The values of I corresponding to fields of medium strength have, however, been considerably increased, and there is a most marked improvement in magnetic quality for low magnetising forces. As the temperature rises to

¹ Proc. Roy. Soc. Edin., xxix., p. 182. (1909.)

² Proc. Roy. Phil. Soc. Glas., xli. (1910.)

a red heat the saturation intensity falls decidedly, but there is a further improvement corresponding to low fields. After a temperature of about 670° C. has been attained, any increase in temperature results in a rapid falling off in quality for all values of the magnetising force. For this specimen the critical temperature is about 700° C. It is interesting to observe how the temperature

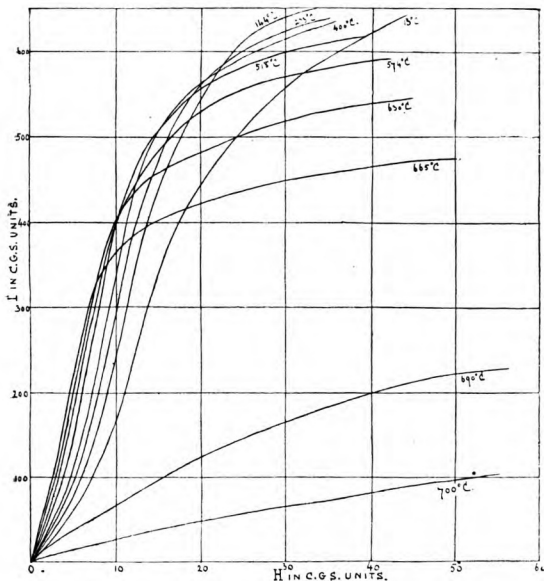


FIG. 1.—SPECIMEN OF HARD STEEL. MAGNETISATION CURVES FOR VARIOUS TEMPERATURES.

for maximum susceptibility decreases with increase of the applied magnetic field. Thus for $H = 1$, the best temperature is 650° ; for $H = 10$, about 600° ; for $H = 30$, 160° ; and for $H = 100$, room temperature.

These variations of quality with temperature for different values of H are best shown in Fig. 2, where the susceptibility is shown

as a function of the temperature. This diagram gives prominence to the remarkable improvement in quality for low fields which is attained just before the transformation of the material from the magnetic to the non-magnetic condition.

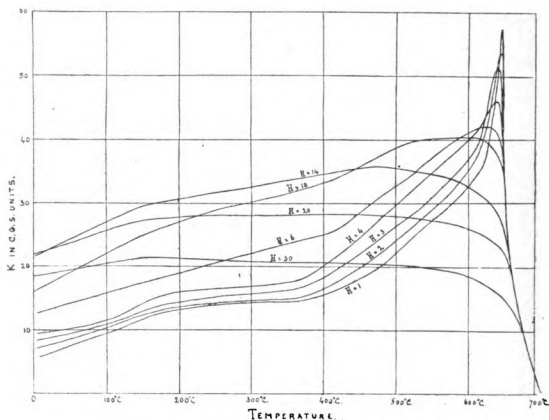


FIG. 2.—SUSCEPTIBILITY-TEMPERATURE CURVES.

The work described in this paper has been carried out in the Natural Philosophy Institute of the University of Glasgow, under a grant for research from the Carnegie Trust, and the author desires to acknowledge her indebtedness to Dr J. G. Gray for advice and assistance given in connection with the experiments.

The Legal Control of Inebriates.

By JOHN CARSWELL, F.R.F.P.S.G., J.P., Member of the Scotch
Departmental Committee on the Inebriates Acts.

[Read before the Society, 1st December, 1909.]

THE reports of the English and Scotch Committees on the operation of the law relating to inebriates and their detention in reformatories and retreats make it clear that the practical failure of the existing acts to secure the beneficial results anticipated from their operation is due to two causes, first, the absence of provision for the compulsory control of certain classes of inebriates, and, second, the failure of local authorities to provide adequate reformatory accommodation for the detention of habitual police inebriate offenders, for whose compulsory confinement powers are given under the "Inebriates Act" of 1898.

As regards the first cause of failure, it may be said at once that the provisions of the Act of 1898 relating to the committment to retreats of habitual drunkards who are not police offenders, and who are not charged with indictable crimes, have made no material improvement upon the Act of 1879. The experience in that connection of the working of the 1898 Act has only confirmed the views, held strongly in 1898, but not embodied in that Act, that the voluntary admission to Retreats is quite inadequate for the needs of the case. The second cause of failure cannot be discussed without raising many difficult and complex questions. The experience of local authorities and others who have made provision for the reformatory care of police cases has yielded at least two valuable results. It has, first, shown the type of persons who are habitual police offenders on account of drunken habits, and how far they are amenable to reformatory care, and, second, it has revealed the attitude of local authorities to the question of whether the burden of maintenance of inebriates in reformatories should be a local or an imperial charge. It was inevitable that this question, in its public aspects, should pass through a pre-

liminary experimental stage, and the money spent in gaining the necessary experience may be considered to have been well spent.

It is certainly the case that the hopes anticipated by the framers of the Act of 1898 have not been realised. What those hopes were may be gathered from the following passage taken from a circular letter issued by the Secretary for Scotland to Local Authorities of date February 22, 1899.

“From the police returns appearing in the appendices to the Report of the Committee, it is evident that, unless a most deterrent effect is produced by the passing of the Act, provisions will have to be made for a considerable number of cases which, so far as Burghs are concerned, will probably be increased if the charges of breach of the peace can in some instances be replaced by charges of drunk and disorderly, as pointed out by the Committee in their report. . . .” And he goes on to say that he “earnestly hopes . . . that a fair and reasonable experiment of the Act may prove, not only that a large percentage of these unfortunate inebriates are capable under careful and humane treatment of reformation and restoration to useful lives, but that ultimately both the Imperial and local Exchequer and local funds will in this way be relieved by a sensible decrease in the population now located in our prisons and poorhouses.”

Doubtless better results would have followed a general and persistent enforcement of the powers contained in that Act, but the voluntary adoption of the Act by local authorities, and the apparent hopelessness of most of the cases first sent to reformatories, damped the enterprise even of the most enterprising community.

It has been found in practice that habitual inebriates consist of three groups :—

1. Persons who habitually cause public disorder, or who commit serious crimes while under the influence of drink or drugs.
2. Persons who become habitual paupers on account of drinking habits ; and,
3. Persons who, though not public offenders or criminals, cause much unhappiness to their families, and are a danger and annoyance to themselves and others.

Before proceeding to consider the legal provisions adequate for each group, it may be useful, at this point, to consider what habits or conduct are meant to which the term inebriety may be said to apply. It has to be kept in view that there are no categories of habit or conduct constituting inebriety; inebriety is a quality manifested by habitually drunken persons, but indefinable except in relation to particular persons and specific acts. Both the English and Scotch reports devote some attention to careful discussions of the medical and psychological aspects of inebriety. Those specially interested in this aspect of the matter will find the paragraphs of the English reports interesting and suggestive. The following may be quoted from the Scotch report:—"Much discussion has lately taken place as to whether inebriety is a vice or a disease. The truth seems to be that it is always a vice, and is sometimes a disease as well, from the beginning, but if long enough indulged in, it will always become a disease in any brain, however sound it may have been at the beginning." Apart, however, from theory, experience has shown that of the persons committed to inebriate reformatories under the Act of 1899, over 50 per cent. are degenerate, feeble minded, insane, epileptic, etc.

There are good grounds for believing that those mental and moral defects are in most cases inherent, and are not the direct product of drinking habits. No one who has had large experiences among inebriates can doubt that many of them are congenitally different from normal people, but though many inebriates are not highly intelligent, and the majority are afflicted with unstable or lowly organised nervous constitutions, it has to be kept in mind that it is not because of those defects that they become a danger and a nuisance to the community, but because they indulge to excess in drink or drugs. It would be an unjustifiable refinement of administrative methods to propose to deal with those persons on any other ground than that of their vicious habits. We must look to legislation for the permanent care and control of feeble minded persons on the lines recently indicated by the Royal Commission on the care and control of the feeble minded for adequate provision for those persons who are mentally defective and also inebriates.

If these views as to the nature of inebriety are correct, then it may be said that habitual inebriates are, for the most part, persons

of depraved nervous and mental constitution, who are addicted to the vice of drunkenness, and who are incorrigible to ordinary reason and discipline.

The definition of the term "inebriate" proposed by the Scotch Committee is as follows :—

"An inebriate is a person who habitually takes or uses any intoxicant or narcotic, and while under the influence of such, or in consequence of the effects thereof, is

- (a) At times dangerous to himself or any other person ;
- (b) At times incapable of managing himself or his affairs ;
- (c) At times a cause of harm or serious annoyance to his family or to any other person ; or
- (d) Unfit to have the care of any child of which he is the parent."

The proposed definition calls for a few sentences of comment. The existing definition—section 3 of the Habitual Drunkards Act of 1879—was as follows :—A habitual drunkard means a person who "not being amenable to any jurisdiction in lunacy, is notwithstanding, by reason of habitual intemperate drinking of intoxicating liquor, at times dangerous to himself or herself or to others, or incapable of managing himself or herself, and his or her affairs."

The proposed definition extends the scope of the contemplated legislation to the habitual use of drugs, and also to intoxicants taken otherwise than by drinking. There is no doubt that the drug habit—mainly by the use of tabloids and by hypodermic injections—is fairly common, and is the cause of much mischief similar in kind, though different in its chief manifestations from that caused by alcohol. The term "habitual drunkard" is accordingly not appropriate under the contemplated extension of the scope of the Act, and therefore the term "inebriate" is substituted.

The presence of the term "habitual" has caused in practice considerable difficulty, because it is necessary to prove not only indulgence to excess and danger arising therefrom, but a persistent habit of drunkenness and frequent manifestations of dangerous

propensities. After much consideration the Committee decided to retain the term. They recommend, however, that in the case of repeated police offenders, and also in cases of serious crime, tried summarily or on indictment, "where there have been three previous convictions for certain scheduled offences during the preceding twelve months, or where a person charged has been under detention in a reformatory or under guardianship within the twelve months preceding the date of the commission of the offence with which he is charged; *the onus of proving that he is not an inebriate shall be placed on him.*"

Another important extension of the definition is to make it apply to parents whose drunken habits render them unfit to have the care of children. It was pointed out that the Children Act of 1908 provides for the removal to an industrial school of any child who is "under the care of a parent or guardian who, by reason of criminal or drunken habits, is unfit to have the care of a child," and the Committee considered it a reasonable proposal to provide for the other alternative, viz. :—the removal of the parent to a reformatory, because in many cases a child might be suitably cared for either by the sober parent or by relatives, if only the real difficulty of the case was relieved by the removal of the drunken parent.

Hitherto compulsory legal control has only been enacted in the case of habitual police offenders and persons charged with serious crime. Provision exists whereby a habitual drunkard may voluntarily submit himself to confinement for a period not exceeding two years in a retreat, but it has not been much taken advantage of, and is absolutely futile to meet the requirements of the most urgent cases. Both the English and Scotch Committees recommend compulsory control for all inebriates.

The compulsory control of inebriates who have not committed police offences or crimes has been hitherto seriously opposed, but now the recommendation of the Committees has met with almost unanimous approval by legal as well as medical authorities, and by the public press. The point of view is so well expressed in the evidence of Sheriff Christopher Johnston that I may quote one or two sentences from his evidence :—

"No matter," he says, "how degraded and destitute of will power the drunkard may have become, no matter how ruinous his condition may be to himself in mind, body and estate, no matter

what suffering his conduct may entail upon his family, there can be no *initial* compulsion unless he is certified as insane. I am aware," he adds, "of the great difficulty attending any proposal for an alteration of the law in this matter. I suggest it as a question worthy of consideration, particularly with the aid of expert medical opinion. *Personally I have no scruples about compulsion.*"

Medical, legal and lay witnesses confirmed the statement of the case as presented in the words just quoted, and no reasonable difficulty was suggested which might prove insuperable in providing legal machinery for compulsion.

Two further remarks fall to be made upon the definition of the term "inebriate."

The first is that the question whether a man is an inebriate is one of pure fact, and must be decided on evidence. A medical opinion may be a useful part of the evidence, but it is neither essential or final. Only in one important respect, to be referred to immediately, should a medical certificate be an essential part of the arrangement for the committal of an inebriate. The second remark is, that the definition will be interpreted by the Courts subject to the intention of the Act, and as the intention of the Act will be to secure the recovery of the patient, it is not likely that the definition could be used to cover the case of a man, who only occasionally got the worse of drink, and whom foolish or vindictive relatives might desire to punish.

The provisions suggested by the Committee for the care of inebriates consist of:—

- (a) Power to commit to retreats persons who are found to be inebriates, but have not committed any police offence or crime.
- (b) Guardianship.
- (c) Urgency order for a short period of care and treatment.
- (d) Power to commit to reformatories inebriates who are also habitual police offenders, or who have committed serious crime.
- (e) Power to detain in poorhouses inebriates who are also paupers.

Two classes of institutions are proposed for the care of committed persons, called respectively Retreats and Reformatories. Persons

not charged with crime may be committed to a retreat, while police offenders and criminals may be committed to reformatories. It is also proposed that Parish Councils should be entitled to apply to the Sheriff for the committal of a person who is proved to be an inebriate, and has also received poor relief not less than four times during the preceding twelve months, to a poorhouse, and that such poorhouse should be deemed to be a retreat.

URGENCY ORDERS.

Another important provision is suggested for the temporary care of persons suffering from forms of acute alcoholism. The grounds upon which this proposal is made and the procedure suggested may be best indicated by the quotation of a few passages from the body of the report :—

“It has been brought to our notice that many persons suffer from short attacks of temporary mental disorder (the most common type being delirium tremens) caused by excessive indulgence in alcohol, and sometimes by the excessive use of narcotic drugs. Medical witnesses spoke to the existence of this form of disorder, and they stated that for want of any specific legal provision for the proper care, control, and treatment of such cases, serious practical difficulties were experienced in dealing with them. In the majority of cases it is considered undesirable to certify under the lunacy statutes. It was pointed out, on the other hand, that the need which always exists for their immediate care, coupled with the fact that the condition was temporary, rarely lasting longer than fourteen days, made it both impracticable and undesirable to take the formal steps necessary for the committal of such persons to retreats. We are satisfied that a real difficulty exists, and one of frequent occurrence. Such patients, it was stated, are always difficult to manage in their own homes, and are frequently both homicidal and suicidal.

“We accordingly recommend that the care, control, and treatment of such persons for a period of not more than fourteen days, and in such place as the Sheriff may consider satisfactory, should be provided for by an order of urgency to be granted summarily by the Sheriff on the petition of the

nearest available relation or of any other person having an interest. The petition should be accompanied by an affidavit of a medical man to the effect that the case is one of urgency requiring immediate care, control, and treatment. The Sheriff should have power to pronounce the order forthwith, or, if he thinks fit, to require other evidence to be produced in support of the petition."

The need for such provision will appeal to medical men in every practice who are so frequently called upon to undertake the supervision and treatment of persons suffering from various forms of acute alcoholism. It is not likely that this provision will involve the establishment of any new public institutions, or be a financial burden upon the community.

COST OF PROVIDING INSTITUTIONS AND MAINTENANCE OF INMATES.

It is proposed that "the State should, at its own cost, provide for the accommodation and maintenance of all inebriates who are convicted of an offence, and who are committed by the Court." This provision should entirely remove the only real difficulty which has hitherto prevented an adequate use of the powers contained in the Act of 1898. It is earnestly to be hoped that the legislature will adopt this suggestion, otherwise there is every reason to expect that local authorities will object to being compelled to undertake this obligation, and if it is left optional for local authorities, then the present Act need not be amended, because no mere improvement in legal machinery will overcome the reluctance on the part of many local authorities to adopt the Act. At present the State has to bear the cost of maintaining these people in prison, and it seems reasonable that the State should continue to provide for them in reformatories. In any case under the present system of Treasury grants, the State has to bear a considerable share of the expense, and it may be anticipated that under new conditions the cost to the State for the maintenance of inebriates in reformatories managed by the State, would not materially add to the present expenditure. As regards retreats it is expected that private enterprise would adequately provide for the accommodation of persons for whose maintenance a remunerative pay-

ment can be made. Towards the provision of retreats for those who cannot be provided for at their own cost the following suggestion has been made :—

1. "That the local authority (either alone or in combination with other local authorities) should provide for the accommodation and maintenance in retreats of inebriates within their district committed by order of the Sheriff who are unable (either at their own cost or at the cost of those legally liable for them) to pay the charges for maintenance at a retreat. Such accommodation might be provided either by the local authorities erecting or acquiring such retreats, or by paying for the maintenance of inebriates in retreats, the managers of which are willing to receive them. For inebriates who desire to enter retreats and are unable to pay the charges for maintenance in a retreat the local authorities should be empowered to provide accommodation at their discretion."

2. "That, on default of the local authorities, the Secretary for Scotland should have power to require them to provide such accommodation as he may consider necessary, or to combine for this purpose ; and, failing their doing so, to provide the same at their expense."

With regard to the provision of institutions for the care of pauper inebriates it is suggested :—

"That Parish Councils, either alone or in combination, should have power, with consent of the the Local Government Board for Scotland, and subject to such conditions as may be approved of by it, to acquire, make use of, maintain, and manage any existing poorhouse not required or only partially required for poor-law purposes, or to erect a poorhouse, for the detention of inebriates committed as above, and to rate for this purpose."

The Committee make a number of suggestions towards the amending of the existing Acts intended to facilitate the operation of the Acts, the most important of these being the extension of the provision for dealing with inebriates charged with crime to cases tried summarily as well as on indictment. The restriction in the present Act to cases tried on indictment has prevented such cases as charges of cruelty to children, which are usually tried sum-

marily, being brought under the Inebriates Act. It is also suggested that where any person is found guilty in a police court or Justice of the Peace Court of certain scheduled offences, if there is evidence or information submitted by the Public Prosecutor that leads the Magistrate to believe that that person is an inebriate, it should be in the power of the Magistrate to remit him to the Sheriff to be dealt with as an inebriate, and when such person has been convicted of any of these scheduled offences three times within the preceding twelve months, the Magistrate should be bound to remit him to the Sheriff to be dealt with according to law. It has been found in practice that persons who have been three or more times convicted in one year of offences which bring them within the scope of the Inebriates Act, have not been reported to the Sheriff; it is intended that that practice should cease.

NON-CRIMINAL INEBRIATES.

The provision for compulsory committal to a retreat of an alleged inebriate who has not been convicted of any crime being an entirely new proposal, it may be useful to quote in full the suggestions of the Committee :—

1. "That power be given to a relative, friend, or guardian, or other person having an interest, and to the procurator-fiscal, to petition the Sheriff for an order of guardianship, or for the committal to a retreat of an alleged inebriate."

2. "The procedure in the petition should be carried through by any of the persons above mentioned, or by the procurator-fiscal, who, on a *prima facie* case being made out to him, should be required to bring the case before the Court."

3. "When the petition is presented by any person other than the procurator-fiscal it should be supported by a written declaration signed by the petitioner himself and one other person to the effect that the alleged inebriate is a person to whom the Act applies."

4. "The Sheriff should dispose of the petition summarily in camera, unless he otherwise determine, and, if he is satisfied by the evidence taken before him, which need not necessarily include a medical certificate, that the alleged inebriate is an inebriate

within the meaning of the Act, he should have power alternatively :—

- (a) To make an order placing the inebriate under guardianship for a period of one year, or
- (b) To commit the inebriate to a retreat for a period not exceeding six months, and thereafter for a further period under guardianship for a year."

5. "In the event of any of the conditions of guardianship, ordered in terms of sub-section (a) above, being broken by the inebriate, the Sheriff should have power, on the report of the guardian, or, failing him, the original petitioner, summarily to commit the inebriate to a retreat for a period not exceeding six months, with a further period under guardianship for one year."

6. "In the event of a breach of the conditions of guardianship subsequent to detention in a retreat, the Sheriff should have power, on the report of the guardian, or, failing him, the original petitioner, to commit the inebriate to a retreat for a period not exceeding three years."

7. "The Secretary for Scotland should have power to prescribe from time to time the conditions of guardianship, and to approve of their modification in individual cases."

8. "Power should be given to the Sheriff when placing a person under guardianship to apply to his case the provisions of section 72 of the Licensing (Scotland) Act, 1903, relating to the purchase and obtaining of exciseable liquors, and the selling or supplying the same, without the conditions as to previous convictions contained in that section."

The intention of an Act of Parliament should be obvious from its provisions. The object of legislation for the control of inebriates is mainly disciplinary, and as far as possible its methods are calculated to secure the recovery of the inebriate to habits of sobriety. Beyond that no legislation can go, and it is well to recognise that much of the drunkenness of Scotland and the disorder arising therefrom must be prevented by means that cannot be embodied in an Inebriates Act. Viewed in the mass the statistics of crime and street disorder caused by drunkenness are really appalling. Over forty thousand convictions occur each year in Scotland for

drunkenness and being drunk and disorderly, but the repeated offender is responsible for a substantial proportion of those convictions. In Edinburgh during 1908 there were (using round numbers) seven thousand convictions for drunkenness involving five thousand persons, but one-fifth of those were responsible for nearly three thousand convictions in that year, or 40.9 per cent. of the total convictions for drunkenness. Two hundred and thirty four persons who contributed to the total number of convictions had a sufficient number of convictions to render them liable to be dealt with under the existing Inebriates Act. Figures are not given to show the total number of convictions during the year recorded against the two hundred and thirty four persons referred to, but it is obvious that they must have contributed a very large proportion of the total convictions. Similar illustration of the part played by repeated offenders in swelling the total convictions for offences caused by drink can be gathered from all large cities. These people are eminently disorderly in their behaviour, and their drastic removal to reformatories would materially lessen street disorder and largely reduce the statistics of drunkenness in Scotland.

An important practical distinction has been drawn between industrial drinking and convivial drinking. The first form of drinking (industrial) seriously lowers industrial, economic, and physical efficiency, but it may cause very little public disorder. A high death rate from alcoholism and comparatively low figures for disorder caused by drink are noteworthy features of industrial drinking. On the other hand, much public disorder and a comparatively low death rate from alcoholism are the contrasted features of convivial drinking. Drunkenness as indicated by the police statistics of city life is, for the most part, caused by convivial drinking. It is noisy, disorderly, troublesome, and is conditioned by ideas and custom which can only be controlled by the elevation of public opinion and moral ideals. Progress of this kind will materially reduce the convictions for offences caused by drink, but there will still remain the class of intractable, incorrigible, habitual drunkards, who, as we have seen, constitute a comparatively small number of persons, for whose proper control compulsory and prolonged detention under suitable conditions will still be necessary.

Some Early Treatises on Technological Chemistry. Supplement
II. By JOHN FERGUSON, M.A., LL.D., Regius Professor of
Chemistry in the University of Glasgow.

[Read before the Society, 15th December, 1909.]

1. It was at a meeting of this Society on January 6, 1886, that I read a paper on the above topic,¹ and to it added a Supplement on May 2, 1894,² the two together containing an account of forty-nine books and editions in various languages: Danish, Dutch, English, French, German, Italian, on the preparation and use of some chemical substances for practical purposes.

The present Supplement is in two parts and deals, first: with an undescribed edition in German, and, secondly: with two or three editions that have to be added to the list of those in English.

2. These books of chemical receipts fall into half-a-dozen or so well marked groups or types, but comparison of their contents shows that they are all more or less closely connected with one another.

3. The earliest form of the collection of receipts appeared in 1531, without the printer's name, and is entitled:—

Rechter Gebrauch d'Alchimei, mit vil bissher verborgenem, nutzba-
ren vnd lustigen Künsten, . . .³

In 1539, another collection was printed by Cammerlander, with this title:—

Alchimia, wie man alle farben, wasser, olea, salia vnd alumina, . . .
machen sol.⁴

which, however, has as its sub-title, the title of 1531, and purports

¹ *Proceedings of the Philosophical Society of Glasgow*, 1888, XIX., pp. 126-159.

² *Ibid.*, 1894, XXV., pp. 224-235.

³ *Ibid.*, 1888, XIX., p. 126.

⁴ *Ibid.*, p. 137.

to have been compiled by a certain Petrus Kertzenmacher. This book, as well as that of 1531, ran through several editions, which were enumerated in the 1886 paper referred to above. There the 1531 book was described from an actual copy, but the notice of the 1539 edition of the *Alchimia*, was not taken from the book itself, but was copied from the description in a second-hand book catalogue of C. H. Beck's at Nördlingen, and on the strength of that I inserted it as probably the first edition of Kertzenmacher's work.

4. Since the reading of the first paper four and twenty years ago, I had neither heard nor seen anything of this book, until the summer of the present year, when, happening to visit once more the great Germanic Museum at Nürnberg, I spent some time in the department devoted to Chemistry and Pharmacy. There, while looking at the display of manuscripts, books, prints, portraits and pictures relating to these subjects, I observed a small pamphlet with the title :—

Alchimia, wie man alle farben, wasser, olea, salia vnd alumina, . . .
machen sol.

5. This title was quite familiar to me, though the title-page was not, and, as it had all the look of having been printed in the first half of the sixteenth century, it seemed possible that here at last was a copy of Cammerlander's edition of 1539, or, if not, that it might be a copy of an unknown and undescribed edition, which would be equally interesting and valuable. My curiosity having been aroused, I applied to the Director of the Museum, Dr Von Petzholdt, for permission to examine the book. This was immediately and most courteously granted, and in the Library of the Museum I was able to make a minute inspection of the volume at my leisure. Not only so, but further permission was given me to have the title-page photographed, which was undertaken for me by Mr Christoph Müller, who does the Museum work, and by that means I am enabled to illustrate this paper with a facsimile of the title-page and its curious border.

As I had surmised, the volume proved to be a copy of the 1539 edition of Kertzenmacher's tract, which, so far as I know, is the first of that particular type.

6. An account of the book and a list of its contents will now be given, so as to fill up Beck's description as quoted in my original paper. The title may be transcribed as follows :—

PLATE VI.



Alchimia.

Wie mann alle farben was-
s. r, olea, salia, vnd alumina, damit
mann alle corpora, spiritus vnd cal-
ces preparirt, sublimirt vnd fixirt,
machen sol. Vnd wie man dise ding
nutze, auff das Sol vnd Luna wer-
den mög. Auch vom soluiren vnd
schaidung aller metal, Polirung al-
ler handt edel gestain, Fürtrefflich-
en wassern zum etzen, schaiden vnd
soluiren, vnd zletst wie die giftige
dampff zu verhütē ein kurtzer bgrif.
Bym Camerlander zu Straszburg.

Small 4°. 4 leaves not numbered, the signature, probably A, if there was one, has been torn off; B to M in fours; or ff. [4 not numbered], B to Mj numbered [1] to xlj, [3 leaves not numbered]; so in all there are 48 leaves. There are 30 lines to the page, and the book is printed in bold black letter.

In this copy the numbering of K is in arabic numerals 33-36; all the rest are in roman, but in this copy Kiiij and Lj (that is ff. 36 and xxxvij) are awaiting.

On the *verso* of Mj (f. xlj) is the colophon:

Gedruckt zu Strassburg bei M. Jacob Cammerlan- /
dern von Mentz Anno M.D. XXXjX. /

In this copy sheet H seems to be printed on different—apparently thinner—paper, and the edges are uncut while the others are cut.

Collation.

{Aj) The title.

{Aij *recto*) Petrus kärtzenmacher / etwan burger zu Mentz, ein berhümter
Al / chemist, wünscht dem Leser alles guts. / ends *verso*, followed
by a woodcut of a “circulatorium,” and a jar.

{Aiiij *r.*) Woodcuts: Calciniir offen, Violglass and Circulirglass.

v. Woodcuts: Alembicus rostratus, Circulatorium, Referber offen,
Cucurbita, Pellican.

{Aiiij *r.*) Woodcut of a furnace, a still with alembic and receiver; practically
the Offen, Cucurbita, Alembicus and Violglass combined.

v. Woodcut: Balneum Mariæ.

B j *r.* (f. j) the Text begins:

Rechter gebrauch der Al /
chimei, mit vil bissher verborgnen, nutzbaren und lusti /
gen künsten, nit allein den fürwitzigen Alchimisten, sunder /
allen kunstbaren werckleuten, auch sunst aller menigklichen /
in vil weg zugebrauchen.

Fiiij *r.* (f. xix *r.*) Vorred in dz ander buch.

On Kiiij or Lj begins the “Bericht” of Gilbertus Cardinalis, but the be-
ginning is unfortunately wanting. It ends on—

Mj *verso* (f. xlj *v.*) followed by the colophon and a woodcut, already given.

There is probably a woodcut at the beginning of this tract.

- Mij *r.* Register disz buchs, ends *verso*.
 Mij *r.* Woodcut : Figur dess faulen Heintzens.
v. Woodcut : Schaid offen.
 Mijij *r.* Woodcut : Balneum Mariæ, quite different from that on Aijij *v.*
 The distilling apparatus is within a case above a boiler on a furnace,
 so that it is really heated by steam. Outside is the receiver.
 Mijij *v.* Cammerlander's device : a winged draped female figure, with a
 band over her eyes, standing on a ball over a landscape, and carrying
 a shield in her right hand.
 Besides the woodcuts already mentioned some of them are repeated in the text :
 f. x *r.* Viol glass.
 f. xij *r.* Alembicus rostratus.
 f. xvij *v.* A man working at a furnace, assaying (?), and the interior of a
 mine.
 f. xxj *v.* Viol glass again.
 f. xxv *r.* Viol glass again.
 f. 36 or xxxvij may contain a woodcut at the beginning of Cardinalis' tract.
 f. xlj *v.* Cucurbita and pellican.

All these are repetitions, except those on f. xvij *v.*

They are identical with those in the folio editions of Ulstadius and Geber,
 published about this time.

The border round the title-page is a reproduction of the same pieces of
 apparatus.

7. As the index in this edition differs in detail from those in later
 editions which I have seen, it may be reproduced here for the
 convenience of those who may wish to compare any of those
 editions with it.

Register disz buchs	Mij <i>recto</i> .
Alle ertz flüssig machen	xxxvij.
Atrament machen	iiij.
Alun calcinirn	v.
Aquam causticam machen	vij.
Aquam Mercurij machen	vij.
Aquilla wasser machen	ix.
Alle metal schaiden	xxxvj.
Alle spiritus fixirn	xij.
Alle spiritus wider in 3r erste materi zubringen	xvij.
Borax vj. Bleych golt ferben	xxxvj.
Calcem Lune preparirn ad Calcem Sol's	xiiij.
Calcinir offen zumachen iij. Cinober	j ij.
Crocum Martis zemachen	x.
Ducaten golt vnd postulatz gulden zemachen	xxxvj.
Eyerschalen calcinirn iiij. Elixir	xxxij.
Eyn starck wasser das eisen schmelzt	xxxvij.

Goldt von kupffer schaiden		xxxiiij.
Golt von vergultem kupffer schaiden		xxxvj.
Jouem calcinirn		xvj.
Koleni verborgne kunst vom goldt machen		xxxiiij.
Lac virginis wasser zemachen		ix.
Lasur j. ij.	Lunam machen	xvij. xxiii.
Martem calcinirn		xvij.
Mercurium congelirn vnd herten		viiij.
Mercurium sublimirn		xj.
Oleum tarari (sic) x.	Oleum bendictum (sic)	x.
Oleum sulphuris x.	Petroleum	x.
		Mij verso.
Pleiweiss		iiij.
Polirung aller handt edel gestain		xxxvij.
Sal commune v.	Salarmoniac	v.
Sal alkali vj.	Salpeter	vij.
Saturnum calcinirn xvj.	Spangritin	ij iiij.
Semperardes wasser x.	Solem calcinirn	xvj.
Sulphur purgiren und sublimiren		xj.
Solem machen xxij.	Seyffen goldt	xxxiiij.
Sol von luna schaiden xxxv.	Silber soluiren	xxxv.
Silber von schwefel bringen		xxxvj.
Thutiam calciniren iiij.	Venerem calciniren	xiiij.
Under welchē planetē gut oder bö's in fewr werckē		xxxvij.
Wasser dz alle metal durchschmeltzt in einer stüd		xxxvij.
Wasser sal alkali ix.	Weinstein calcinirn	iiij.
Wie man man (sic) alle metal hammern sol.		xvij.
Wie mann ein dritttagig fewr machen sol.		xx.
Wie man sich hüten sol vor den giftigen bosen dampffen / der metal		xxxvij.

¶ Ausslegung etlicher latinischen wörter.

Sol goldt. Luna silber. Mercurius Quecksilber.
Mars eisen. Jupiter zin. Saturnus blei. Venus
Kupffer. Allumen allun. Sulphur schwefel. Aqua
Wasser. Jgnis fewr. Acetum essig. Antimonium
spiess glass. Calx puluer. Calciniren zu puluer machen.
Coagulirn schmeidig machen. Corpus ein jedes metal
oder materi. Soluirn, zertreiben, zerscheyden.
Preparirn bereyten. Purgiren reinigen. Reducirn wi
der bringen.

This list of words is contained in most of the editions.

8. To complete the view of the contents of the treatise and to facilitate comparison of this very rare first edition with those which came after, a list of the chapters under which the subject is comprised may be given.

BOOK I.

Fol.	j r.	Cap.	j.	Wie man Cynober machen sol.
			ij.	Wie man Lasur machen sol.
			iiij.	Lasur zumachen.
	ij r.		iiiij.	Eyn ander kunst Lasur zumachen.
			v.	Eyn ander kunst Lasur zu machen.
			vj.	Cynober zu machen.
			vij.	Spangrün zu machen.
	iiij r.		viiij.	Eyn ander ler von Spangrün.
			ix.	Eyn ander ler von Spangrün.
			x.	Wie mann pleiweiss mache.
			xj.	Von den offen.
			xij.	Von dem calcinier offen.
	iiiij r.		xiiij.	Vom offen sublimationis.
			xiiij.	Wie man weinstein calcinieren soll.
			xv.	Vom besten atrament.
			xvj.	Wie man eyerschaln calcinieren soll.
			xvij.	Wie man Thutian soll calciniren.
			xviiij.	Wie man Alun calcinieren soll.
	v r.		xjx.	Wie mann sal commune sol machen.
			20.	Vom sal armoniaco.
	vj r.		xxj.	Wie mann sal alkali sol machen.
			xxij.	Wie mann sal borax machen sol.
			xxiiij.	Eyn ander kunst Borax zumachen.
			xxiiij.	Vom goldtschmidt Borax.
	vij r.		25.	Wie mann Salpeter sol machen.
			26.	Von den wassern.
			xxvij.	Wie mann aquam causticam sol machen.
	viiij r.		xxviiij.	Wie mann Mercurium congelieren vnd herten sol.
			29.	Wie mann aqua Mercuij sol machen.
	ix r.		xxx.	Von wasser Aquila.
			xxxj.	Wie man das wasser lac virginis sol machen.
			32.	Vom wasser salis alkali.
			33.	Vom wasser crocus Martis.
			34.	Ein ander ler von croco Martis.
	x r.		35.	Vom wasser semper ardens.
			36.	Wie mann oleum Tartari machen sol.
			37.	Wie mann Petroleum mochen (<i>sic</i>) sol.
	xj r.		58 (<i>sic</i> for 38).	Vom oleo benidicto.
			39.	Wie mann oleum sulphuris sol machen.
			40.	Wie mann sulphur purgieren sol.
			41.	Sulphur zu sublimieren.
	xij r.		42.	Wie mann Mercurium sublimieren sol.
	xiiij r.		xliij.	Wie mann alle spiritus fixiren sol.
			44.	[Die sieben Planeten calcinieren, &c.]
	xiiij r.		45.	Wie mann Solem calcinieren soll.

	46.	Wie mann Lunam calcinieren soll.
	47.	Eyn ander calcinatio Solis.
	48.	Eyn ander calcinatio Solis.
Fol. z.	49.	Wie man calcem Lune sol preparieren ad calcem Solis.
	50.	Wie mann Venerem soll calcinieren.
xv z.	51.	Ein ander kunst Venerem zu calciniren.
	52.	Eyn ander calcinatio Cupri.
z.	53.	Eyn ander calcinatio Veneris.
xvj z.	54.	Eyn ander calcinatio Veneris.
	55.	Wie mann Saturnum calcinieren sol.
z.	56.	Eyn ander calcinatio Jouis vnd Saturni.
xvij z.	57.	Ein ander calcinatio Jouis.
	58.	Wie mann Martem calcinieren sol.
z.	59.	Eyn ander calcinatio Martis.
	60.	Wie mann alle spiritus wider in jr erste materi bringt.
xviii z.	61.	Wie mann alle metalla hammern kan.

BOOK II.

Fol. xix z.	Cap. j.	Wie mann Lunam machen sol.
xx z.	ij.	Wie man eyn dritttagig feur machen sol.
xxj z.	iiij.	Ein ander operatio ad Lunam.
xxij z.	iiij.	Solem zumachen.
xxij z.	v.	Eyn bewerte operatio ad Lunam.
xxiiij z.	vj.	Eyn ander operatio ad Lunam.
	vij.	Eyn ander operatio ad Lunam.
z.	vij.	De Sole bono.
xxv z.	ix.	Eyn ander operatio ad solem.
	x.	Eyn ander operatio ad Solem.
xxvj z.	xj.	Ad augmentationem Solis.
z.	xij.	Eyn ander operatio ad Solem.
	xij.	Ad Solem.
xxvij z.	xiiij.	Eyn gut operatio ad Lunam.
xxx z.	xv.	Operatio ad Solem und Lunam.
xxxj z.	xvj.	[No title, but apparently the same continued.]
xxxij z.	xvij.	Wie mann Solem machen sol.
33 z.	18.	Von atrimenti (<i>sic</i>).
	19.	Eyn wasser aqua lilij.
z.	xx.	[Archilaus. Solem machen.
		Primum—quartum Elixir.]
34 z.	21.	Kolenus, vom goldt machen.
	22.	Eyn ander operatio ad solem bonum.
35 z.	Cap. xxij.	Seyffen goldt machen.
z.	24.	Wie mann golt von kupffer schaiden sol.

[Two leaves are wanting here. In the 1589 edition they contain the following sections :

	Cap. xxv. Wie man Solem von Luna scheiden soll. Gilberti Cardinalis kunst alle Metall zu soluieren, with a woodcut of a man distilling. Silber zu soluieren. Silber von Schwefel zubringen. Ducaten golt von Postulatz gülden zumachen. Goldt vom vergülden scheyden.]
Fol. xxxviii r.	Alle metal zu schaiden. Bleych goldt fermen. Alle Ertz flüssig machen. Die Planeten darunder gut oder boss in fewr wercken.
7.	Von polirung allerhandt edel gesteyn.
xxxix r.	Eyn starck wasser das eisen schmelzt. Eyn bewert wasser das alle metal durch schmelzt in einer stund.
7.	Eyn wunderbar starck wasser viler krafft. Von den giftigen bosen dampffen vnd rauchen der Metal, wie man sich dabei halten, vnd dero gift vertreiben sol. ein kurtzer bericht an gemeine goldt schmit.
xl. r.	Von dem dampff des Quecksilbers, Bleis, vnd andern metal damit die Goldt schmit gewonlich vmb gan.
7.	Wie man den schaden diser dampff sol mindern vnd wenden.

9. The second part of this Supplement contains additions to the list of English editions described in the original paper. The English version may have been made from a Dutch or German original, but possibly it is a collection from several sources, as formerly explained.

10. Besides the editions there described I have found mention made of other three, though it has not been my good fortune to see any of them. The references, however, help to construct what, I should presume, is a complete list so far as it goes, unless there be an edition between 1588 and 1596, which is not impossible.

They may be taken chronologically :

1583. This has been already described.¹
1588.
1596. Already described.²
1600.
1605 Already described.³
1606

The undescribed editions may now be considered briefly.

11. 1588. The title here given is copied from Andrew Maunsell, and is obviously contracted.⁴

Remedies to take out Spottes and Staines, in Silkes, Veluets, Linnen & Wollen clothes. Also how to Die Silks, Linnen, and Wollen, etc. Also to dresse Leather, & to colour Fells, Howe to Gylde, Graue, Sowder, and Vernishe, and to harden and make soft Iron & Steele, translated by L. M. Prin. by Tho. Purfoote. 1588. 4°.

This edition is quoted by W. Carew Hazlitt⁵ without detail, as follows, but he does not say where a copy is to be seen.

A profitable booke declaring dyuers approued remedies to take out spottes and staines, in silkes, veluets, &c. Translated out of Dutche. Lond. 1588. 4to.

12. 1600. In the same place Hazlitt quotes an edition of this date :

London Printed by Iohn Wolfe, and are to be sold by Edward White, &c. 1600. 4to. With woodcuts.

If it contain woodcuts it differs from all the editions which I have seen.

13. 1606. For this edition Hazlitt refers to the Harleian Catalogue, but supplies no particulars, and I have seen no other notice of it. As there was an edition of 1605, already described by me, it is not likely that a new one was called for in 1606. It seems more probable that the reverse was the case ; that the sale of the book had slackened and that a new dated title-page was inserted to give it a recent look. That however is a mere conjecture.

¹ *Proceedings of the Philosophical Society of Glasgow*, 1888, XIX. p. 148, No. 15.

² *Ibid*, p. 148, No. 17.

³ *Ibid*, p. 152, No. 20.

⁴ Maunsell, *Catalogue of English printed Bookes*, London, 1595, Part II., p. 23.

⁵ *Handbook to the Popular, . . . Literature of Great Britain*, 1867, p. 382.

14. The possibility of the existence of an edition between 1588 and 1596 is based on the interval of four or five years between the other editions, which makes the gap of eight years anomalous. If this were a solitary instance there would be no reason to take notice of it, but there are so many examples of editions of these receipt books being published every four or five years, that, as I have pointed out elsewhere, one may almost calculate on the recurrence of new editions at that interval. So there may have been an edition of this tract about 1592 or 1593.

15. According to most authorities, the translator's initials L. M. stand for Leonard Mascall, whose name I did not know in 1888. There is some diversity of opinion about him, owing to the dates assigned to his works making it difficult to believe that they can be the composition of one person. Leonard Mascall is mentioned as early as 1514; Leonard Mascall was clerk of the kitchen to Matthew Parker, Archbishop of Canterbury in 1573, and his death is placed in 1589. On the other hand a book under his name was published in 1596, and Leonard Mascall is called farrier to King James, which would bring him down to 1604. Pending the solution of the problem of one, or of two, or more Mascalls, it may be stated that a person of the name had the reputation of being skilful in the breeding and treatment of horses, dogs, cattle, sheep, goats, and hogs, skilful too in arboriculture, agriculture, country sports, raising of poultry, fishing, grafting, and practice of medicine, and he published books on these topics. Having given elsewhere some account of Mascall and his books, it is unnecessary to say more about him here.¹

¹ *Transactions of the Glasgow Archaeological Society*, Vol. V. p. 135, and Addenda. (Reprint, 1908, Supplement V. §§ 17-21, and Addenda.)

Walter Map. By WILLIAM TOD RITCHIE, M.A.

[Read before the Historical and Philological Section,
2nd March, 1910.]

DURING the period when the English language was allowed to fall into disuse as a book-speech, there were many cultured writers who made Latin serve as the medium for the expression of their ideas. Amongst the historical writers of the twelfth century we see the large figures of William of Malmesbury, Richard Fitz-Neal, and Ranulph de Glanville. But there were active producers of imaginative work as well; and among the dealers in romance a place must be found for Geoffrey of Monmouth, Giraldus Cambrensis, Nigel Wireker, and Walter Map.

We are indebted to Map himself for most of our knowledge of the actual facts of his life. The probable date of his birth may be set down as 1145, and the place in Herefordshire. He speaks of the Welsh as compatriots,¹ and of himself as a Marcher² of Wales. He studied at Paris between 1154 and 1160: he makes it his boast that he writes what he has seen or knows³; so that when he describes some of the fights between the Town and Gown of his day,⁴ we may with safety suppose that the young student, who had certainly been subject to Celtic influence if he were not also of Celtic stock, did not stand by as an idle onlooker when the fight was raging fast and furious. He was well received at the court of Henry II., who showed him kindness both on his own account and because his parents had previously proved their loyalty.⁵ He was intimate with Thomas Becket in his pre-Archbishop days,⁶ and as one of the King's clerks he learned the ways of diplomacy, being employed on foreign missions both in France and in Italy. As a member of the court at Limoges⁷ in

¹ De Nugis Curialium (Camden Society) II., XX., p. 94. ² *Ibid.* II., XXIII., p. 99. ³ *Ibid.* V., V., p. 212. ⁴ *Ibid.* V., V., p. 217; II., VII., p. 73. ⁵ *Ibid.* V., VI., p. 235. ⁶ *Ibid.* II., XXIII., p. 99. ⁷ *Ibid.* II., III., p. 69.

1173 he was commissioned by Henry II. to entertain Peter, Archbishop of Tarentaise. At the Lateran Council held at Rome in 1179 he argued, at the request of the Pope, with the representatives of the sect of Waldenses.¹ On his way to this Council, which was summoned by Pope Alexander III., he was the guest of Henry, Count of Champagne.² He was on intimate terms with Louis le Jeune, the French king, with whom he had an interesting conversation on wealth.³ He was present in Anjou in 1183⁴ when Walter of Coutances was appointed to the see of Lincoln, just relinquished by Henry II's natural son Geoffrey. With Geoffrey Map was not on good terms, but with Henry's eldest son, the young prince who died in 1182 shortly after his coronation, Map's relations must have been very different, for he speaks of him with high praise.⁵ At the time of the young king's death on St. Barnabas's Day (the 11th of June) Map tells us he was at Saumur :⁶ and there he was writing part of his *De Nugis Curialium*. He sat on the bench as Judge Itinerant at Gloucester in 1173, and twelve years later there is a record of him filling the same office for Herefordshire and the neighbouring counties. As one of the secular clergy he held ecclesiastical preferments ; he was canon of St. Paul's, London ; precentor and chancellor of Lincoln ; and finally Archdeacon of Oxford in 1197. He had the living of Westbury in Gloucestershire, but he was no greedy accumulator of benefices like the notorious John Mansel, Henry III's keeper of the seal. He was an unsuccessful candidate for the bishoprics of Hereford and St. Davids. He was still living in 1208, but Giraldus Cambrensis in 1210 speaks of him as dead, and this would seem to be borne out by a reference in a Hereford missal, where the date is given as 1st April. Both a churchman and a courtier, he was afforded ample opportunity of displaying his talents. The record of work that has been accredited to his name should be proof enough that he did not altogether fail to take occasion by the hand.

Giraldus Cambrensis has preserved a record of Map's courtly jests, and to this he has added the information that Map was a scholar who knew both law and theology, and a student of

¹ *De Nugis Curialium* (Camden Society) I., XXXI., p. 64. ² *Ibid.* V., V., p. 216. ³ *Ibid.* V., V., p. 215. ⁴ *Ibid.* V., VI., p. 237. ⁵ *Ibid.* IV., I., p. 138-9. ⁶ *Ibid.* IV., I., p. 139.

literature with a decided taste for poetry. Map tells us himself that he had the reputation of a poet; while his prose work, *De Nugis Curialium*, bears witness to the truth of Giraldus' description. The creation of parts of the Arthurian romance, more particularly those parts dealing with Lancelot and the Holy Graal, has been placed to his credit. To Map, too, was ascribed the authorship of a series of satirical poems, which assailed the ecclesiastical abuses of his time. That he was able to create the Bishop Golias, the pretended representative of a loose-living clergy, has been argued from the unfavourable comments which he made upon the court of Rome and the monastic orders both in his conversation and in his *De Nugis Curialium*. In the *Confession of Golias* are to be found those verses, beginning "Meum est propositum in taberna mori," which have been translated frequently as a Drinking Song, and which have led to Map's being regarded as "the Anacreon of his age." But even though he were the recognised author, the fact that the Golias poems are satiric would not by itself be reason sufficient for giving him the title, which in the opinion of his contemporaries was not undeserved, "the jovial Archdeacon."

In the prologue to the romance of *Meliadus*, Hélie de Borron, who lived about 1230, credits "Missire" Walter Map with a share in the translation of the stories of the Holy Graal from Latin into French, and in ascribing to him the production of the Lancelot writes of him in these terms, "qui estoit clerc le roi henri." That is in agreement with the thirteenth and fourteenth century manuscripts which attribute to Map the compilation, and the translation from Latin into French, of the romances of Lancelot du Lac (two parts), the Quest of the Saint Graal, and the Morte Arthur. In the MS. Egerton 989 Hélie de Borron writes in the epilogue to *Tristram* "maistre gaultier mappe quj fist le propre liure de M. lancelot du lac." The authority of writers, compilers and scribes, who are almost contemporary, should go far to prove Map's claim to the fashioning of much of the Arthurian romance. But there is yet another strong support in the Romance of *Ipomedon* written by Hue de Rotelande, a poet living at Credenhill near Hereford. The author has just been describing how Ipomedon, in love with La Fièrre, has sent the three suits of armour with the message that the white, red and black knights of the tournament were each and all of them the former cup-bearer of La Fièrre. He then continues

"Ore entendez seignurs mut ben
 Hue dit ke il ni ment de ren
 Fors aukune feiz neent mut
 Nuls ne se pot garder par tut
 En meudre afere mut suwent
 Un ben renable hom mesprent
 El mund nen ad un sul si sage
 Ki tuz iurz seit en un curage
 Kar cist secles lad ore en sei
 Nel metez mie tut sur mei
 Sul ne sai pas de mentir lart
 Walter Map reset ben sa part."

"Now listen, lords, Hue says he is not lying at all, or at least only a little here and there. A man may often mistake about a thing, and there is no man wise enough to be always of the same mind. And indeed this age bears the fault within itself, so you must not put it all upon me. I am not the only one who knows the art of lying; Walter Map knows well his part of it." A similar situation had been used by the author of the Romance of the *Lancelot du Lac*, and it is possible that Hue de Rotelande had this in mind when he claimed kinship with Map in the field of romance. "The great prose St. Graal professes to be a translation from Latin made by Robert de Borron; but when the real work of Robert de Borron was edited by Michel in 1841, it was found to be nothing but a short poem, which had supplied the foundations for the prose Romance. By applying the same principles to the prose Lancelot, we should naturally conclude that it was founded upon a poem by Walter Map. In short, the only defect in the evidence, so far as we can judge, has been the want of some contemporary allusion, and this want seems to be fully supplied by the passage in Ipomedon." (Ward, Catalogue of Romances in the Department of Manuscripts in the British Museum, I., p. 735.)

Mr C. L. Kingsford, the writer of the article on Map in the Dictionary of National Biography, thinks it strange that Hélie de Borron should speak of Map as a royal clerk instead of by his later and more famous title of Archdeacon. But when we remember that Hélie himself was ordered by Henry III. of England to continue the translation of much in the "grant liure del graall" that had not been translated, it seems quite pardonable on his part to think of his predecessor in the work as a clerk of the previous Henry II. Besides, it is fortunate that he has spoken of Map as

clerk, because he has escaped the danger of confusing Walter Map with another Archdeacon of Oxford, Walter Callenius; a danger which was not impossible, when we bear in mind that Walter Callenius brought a book in the British (or Breton) language to England for his friend Geoffrey of Monmouth to found his *Historia Regum Britanniae* upon. And just as there is some doubt whether Map's original poem was in Latin or Anglo-French, so is there doubt about the first form of Walter Callenius' book, whether it was written in Latin or Welsh. On that account, then, it is fortunate that Hélie de Borron (whatever his reason for it) described Map as "clerc le roi Henri." That he was personally interested in romance may be taken for granted by any reader of his *De Nugis Curialium*, especially of the tales in the third book. We can fancy him enjoying the company of Henry I., Count of Champagne, who was his host on one of his visits to France;¹ and we may almost hear their conversation turn on contemporary romances, for this Count Henry I., le Large, or as Map calls him "omnium largissimus," was the patron of Jehan li venelais (sometimes known as "li nevelois"), the writer of a chanson de geste, *La Vengeance D'Alexandre*.

Alongside of the thirteenth and fourteenth century manuscripts' ascription to Map of the authorship of part of the Lancelot Romance we may set his own statements and those of his friend, Giraldus Cambrensis. The latter speaks of him as a man of poetic taste, whose "dicta" had brought him a considerable reputation. It is possible that his repeated references to Map's French "dicta" may mean more than mere spoken jests: the word was almost equivalent to "rithmi," and may bear the same meaning as the French "dites." Thus there may be a distinction between "dicere" and "scribere;" the former may refer to composition in the spoken language, while the latter may apply only to what is written in Latin. If that reading is allowed, there may be a deeper significance in Map's words to Giraldus, "Nos multa diximus; vos scripta dedistis et nos verba." In a long and learned letter to Map, Giraldus urges his friend to "give up the frivolous rhymes of his youth and betake himself in his age to the study of divine theology." Some elegiac verses by Map are preserved in Giraldus' works; and if he had not been recognised as a skilled writer of

¹ De Nugis Curialium V., V., p. 216.

verse, why should he say in the *De Nugis Curialium* that he had been requested to "poetari," to make a poem of his "sayings and doings that have not yet been committed to writing"? If he did write Anglo-French poems, as there seems no good reason to doubt, it may have been his work on which was partly founded the *Lanzelet* of Ulrich of Zatzikhoven.

Perhaps it is as satirist that Map has been best known, and by way of introduction to that question we may quote the theory of M. Paulin Paris that "Map wrote his romances in defence of Henry's opposition to the Roman courts, and that the legend of Joseph of Arimathea constituted a claim for pontifical supremacy in defiance of the Pope." Map certainly did make fierce attacks on the ecclesiastical orders: that we know from his *De Nugis Curialium*. But to him was attributed the authorship of much of the Goliardic verse of the twelfth and thirteenth centuries.

There is a certain type of mind which refuses to accept anything which cannot be labelled. And if it is hard to find suitable labels which will fitly describe every man, it is equally hard to classify periods in the history of peoples or of literature. The twelfth century means to some the glorification of the Crusades; but the finer emotions that were stirred in many did not drive out the lower and baser passions of the more. Even in the same individual the two tendencies are marked: the potential sinner and saint is everywhere. Against the enthusiasm of Western Europe for the cause of Christ, as it appeared in the need for defence of the Holy Sepulchre, we must set the vice of the age, which provided the subject for a body of literature called Goliardic. The Wandering Students, the Vagi Clerici, of the twelfth century formed themselves into an Order, whose note was distinctly pagan. They shadow forth the greater movement, three centuries later, of the Renaissance and the Reformation. The love of beauty and of truth are here to be seen very much alive in the twelfth century. Regarded on their more sensuous side they present a picture which would seem to deny the Middle Ages' claim to be a golden age. The abuses of the Church of their day were like the proverbial poor, ever present. The Wandering Students looked up to Goliath as patron of their order, and as Goliardi, or disciples or sons of Goliath, they came to be known. The name Goliardi is of doubtful origin: it is uncertain whether the patron or the follower was first in the philological field. The word seems to have been derived

from the Latin *gula*; in which case the Goliardi were reputed gluttons. It is with *gulositas* that Giraldus Cambrensis couples Golias. The Goliardi were classed with jongleurs and minstrels, probably fulfilling the same function among the clerical orders as the latter did among the laity. Piers Ploughman introduces goliardeis, "a gloton of wordes," speaking in Latin rhyme; while Chaucer applies the term to the Miller,

"He was a janglere and a goliardeys,
And that was moost of synne and harlotries."

The rubric to a MS. of the thirteenth century, in the Ashmolean Museum, Oxford, reads as follows:—"The attack of Master W. Bothewald, canon and superior of the Church of St. Frideswide, against Walter Mat (?), archdeacon of Oxford, who both in his youth and old age was wont to write scoffing sarcasms, both in metre and prose, on the White Monks, to the discredit of the same." A line is given which appears to have been taken from the poem of Map which is the object of Bothewald's attack:—

"Lancea Longini, grex albus, ordo nefandus."

In this invective Bothewald speaks of Map's hatred of the Cistercians or White Monks as arising from a failure on their part to pay him tithes. In the *De Nugis Curialium* Map himself speaks of the Cistercians thus:—"They say with the Pharisees, 'We are not as other men'; but they do not say 'We give tithes of all we possess.'" Bothewald makes a curious reference to Map's *Nugas* as becoming a youth, but not an old man. Map is addressed by name Walter, and also Archilevita, and is advised that "if the mockeries of his *Nugae* are not wiped out by repentance in this life, he will find himself under a delusion." Is it possible that Bothewald refers here to Map's *De Nugis Curialium*, in which we find attacks upon the monastic orders, and more particularly upon the Cistercians or White Monks? The reference to the failure of the monks to pay tithes is interesting when we remember Giraldus Cambrensis' story of the cause of Map's personal animosity to the Cistercians. "A certain monastery of that order, on the edge of the Forest of Dean and not far from Newenham, founded on the spot where Count Milo of Hereford had been wounded to death by the chance stroke of an arrow

aimed at a wild beast, seized a large part of the Church of Westbury, of which the Archdeacon was then acting parson; for this reason he was very angry and bitter against the whole order and specially against that house. When he was in attendance at the court of King Henry II., and when he several times was engaged with the Justices-in-Eyre in keeping the laws of the realm and exercising justice for the king, every time that the king was in the usual manner exacting the oath from him and his colleagues for giving law faithfully to each, the Archdeacon was wont to add always to his oath that he would be according to his power faithful in the exercise of his power to all except Jews and White Monks. When the king, who was provoked to laughter, asked the reason for such an exception, he replied that it would be distinctly absurd and unjust to show justice and equity to those who were prevented by their base greed showing justice and equity to any one, but were rather driven by that same fault to lay violent and unjust hands on other peoples' property, and to appropriate to themselves by hook or crook what was not their own."

Manuscripts of the fourteenth century attribute the authorship of some of the Goliardic poems to Map, more particularly of that one entitled *Apocalypsis Goliae*. The only poem in Wright's collection of "the Latin Poems commonly attributed to Map," which deals with the White Monks, appears as the work of a "discipulus Goliae episcopi." The authorship, however, was generally ascribed to Golias, the pretended bishop, himself. This is how Giraldus Cambrensis speaks of him:—"A certain parasite called Golias, who in our time obtained wide notoriety for his gluttony and lechery, and by addiction to gulosity and debauchery deserved his surname, being of excellent culture but of bad manners, and of no moral discipline, uttered oftentimes and in many forms, both of rhythm and metre, infamous libels against the Pope and Curia of Rome, with no less impudence than imprudence." Giraldus' attack on Golias, the anonymous author of *Confessio Goliae* and *Golias in Romanam Curiam*, is regarded as proof positive that Map, who was Giraldus' friend, could not have been the author. But is it so certain that this line of argument is a good one? Too much has been made of the friendship between Giraldus and Map as a hindrance to such an attack, if Map had any serious claim to the authorship of the poems. In 1203 Map was one of the candidates for the vacant see of St.

Davids; and Giraldus suggested his name, but the sincerity of his suggestion is doubtful, as he knew that his nominee was likely to be rejected. In any case Giraldus changed his mind often: he could attack a man and again compose the difference between them. And why should he not be able to speak both well and ill of Map? He preserves some of the jests Map made at the expense of the clergy; he calls him “*vir lingue dicacis et eloquentiæ grandis illorum et similium sugillans avaritiam episcoporum.*” Besides, Map himself has made in his *De Nugis Curialium* his strongest attack on the evils of the Papal Court at Rome, when he says ROMA means Radix Omnium Malorum Avaritia.¹ Again, after a long invective on the Cistercians Map admits that he has been called a persecutor of religion.²

“I find fault with vices, not morals; with false professors and not a well regulated order. Those who afflict the flesh to keep Venus in check, who feed the poor that God may show them mercy, who rise in the middle of the night to make confession, I do not blame. But they who with all zeal find and follow every way of gain, who open and enter every gateway of avarice, who plan no cruel way to profit without pursuing it to the end; these are what it becomes us to hate, and it is from our knowledge of these that we are drawn into complaining. It is the servants of such we shrink from and censure, whenever the masters themselves are not found engaged in those practices. I see that I have already become a subject for their evil-speaking, so that they liken me to the poet Cluvienus, a user both of chalk and charcoal, a tasteless and uncultured writer. This I certainly am; but while my song about knavery is indeed worthy of chalk and charcoal, I am also uncultured; I do not make up things, I do not fawn or flatter, and I am tasteless, because the salt of wit is savourless among a mass of filth. I confess I am a silly, tasteless poet, but not a writer of falsehood. For he who merely states facts is no liar, but he who devises things. I, however, speak about these, i.e., about the Hebrews [so he calls the Cistercians] what I know and what the Church deplores, and I am not without experience; and though they do not have a good flavour, things which now lie hidden in the ear will be preached upon the housetops.”³

¹ De Nugis Curialium II., XVII., p. 87. ² Ibid., I., XXV., p. 57.

³ De Nugis Curialium I., XXV., p. 57.

In his outspoken condemnation of corruption, from whose taint even the Papacy did not escape, he is to be compared with John Gower, who claimed his freedom of speech in his *Vox Clamantis* for a like reason. "I do not affect to touch the stars, or write the wonders of the poles; but rather with the common human voice that is lamenting in this land I write the ills I see. God knows, my wish is to be useful; that is the prayer that directs my labour. No hatred urges me. In the Voice of my Crying there will be nothing doubtful, for every man's knowledge will be its best interpreter." Gower was a good churchman, but his dislike of Lollardry did not blind him to the evils of the Church. Giraldus Cambrensis knew well that the Church was not perfect; his life is a proof of the contrary. Why, then, should Map be considered incapable of writing such poems as some critics prefer to put down to the credit of Walter of Lille? It is true that there is much in the Goliardic verse that is not to be considered as other than pagan and even unclean. But the pagan element had not been swept out of the Church of that time with any greater success than it has been sought to purge it from man to-day. Map hints at the reason for such things appearing in his writings, when he pithily says "you can't smell salt in a dunghill."

The Goliardic verse was evidently not peculiar to one country, for the class which sang the verse was cosmopolitan, though the singer's nationality is not forgotten. If the original authorship is not to be definitely traced to one, would it not be possible to regard the whole of it in much the same light as we consider the Ballad? With this difference, of course, that the Goliardic verse, being current amongst the educated clerkly class, would be set down in manuscript, while the Ballad had to depend for its continuity upon mere memory unaided by pen and ink. Then when the verses were once committed to writing, and even before that, the reciters or singers of them would be only too glad to shelter themselves from persecution by the Church authorities behind the broader backs of greater men. Map's recognised attacks on corruption in the Church, which we still have in his prose, together with those in verse which Bothewald credits to him and which he indirectly admits himself, would be excuse enough for fathering the Goliardic verse upon him.

It is in English manuscripts principally that the name Golias occurs. But we find the same person bearing other names. He

is called Archipoeta and also Primas. Fra Salimbene in his Chronicle gives an account of him under the date 1233, and he raises the question of identity anew. "In these times lived Primas, a canon of Cologne, a great mendicant and a great wit, a quick and frequent writer of verses, who would have been great in divine literature and of very great service to the Church of God if he had given his heart to love God. I have seen the *Apocalypse*, which he made, and several other writings of his." Amongst other verses quoted by Salimbene there appears the whole of the *Confession*. But in the Paris MS., edited by Müldner, the *Apocalypse*, which has been ascribed to Golias, and to Map, and to Primas, is attributed to Walter of Lille. Again we find another claim set up for one who had as patron Reginald of Cologne, Archchancellor of Frederick Barbarossa. This claim appears on a manuscript in the library of Göttingen, and it is here that we find the name Golias replaced by Archipoeta. Thomas of Capua also speaks of him as Primas, and calls his verse rhythmic (*rithmicum*). And finally we have Boccaccio in his *Decameron* (First Day, Novel VII.) describing one of the type of wandering scholar, under the name of Primasso, in words, which would seem to sum up our definite knowledge of the personality of the man who wrote as Golias, or Primas, or Archipoeta, and who has been claimed, probably to satisfy national pride, for Italy, Germany, France and England:—"You must understand, sir, that Primasso was a person well skilled in grammar, as well as a good and ready poet, by which means he became so famous, that though his person was not universally known, his fame and character were in every one's mouth."

The work which is undoubtedly Map's is the *De Nugis Curialium* (Courtiers' Triflings). It is preserved in one manuscript, of which there is a transcript (both in the Bodleian Library at Oxford); and it was printed under the editorship of Thomas Wright for the Camden Society in 1850. That is the only edition we possess. It may be regarded as a sort of scrap-book or note-book, even though it was commenced with a definite object. A friend, Geoffrey by name,¹ has asked him to write a poem, whose subject should be his "sayings and doings that had not yet been committed to writing."² A large order! Map proceeds to write in

¹ *De Nugis Curialium* I., X., p. 14. ² *Ibid.* I., XII., p. 19.

prose, and in his characteristically jocular way he tries to prove the folly of Geoffrey's request.

"Though our court is stormy beyond all others, the mother of pain and the foster-mother of strife, you bid me write poetry amid these discords: you are like to press me with such spurs as those with which Balaam drove the ass to speak. For by what other means can any one be brought to the making of poetry amid such surroundings? But I am in great fear lest through my want of wisdom it should turn out to me otherwise than it did to the ass, and to you otherwise than to Balaam; so that when you compel me to speak I begin to bray, just as it spoke instead of braying, and you make an ass of a man whom you ought to have made a poet. Yet it will be through you that I become an ass, for you bid me; while for yourself, if the rudeness of my bray make me a byword and a jest, take heed lest the irreverence of your command put you to shame. The grounds of my fear are several. My meagre knowledge will accuse me, my childish speech will condemn me, while the present age will despise me because I am not dead. You who bid me write dispose of my first two grounds of fear; but I am unwilling to give up the third, because I still wish to live. In choosing as my subject the sayings and doings which have not yet been committed to writing; you give me material so plentiful that I cannot hope to overcome or even keep up with it, however great my labour and toil. I am to tell whatever I have learned to regard as remarkable or miraculous, so that the reading of it please and tend at the same time to teaching good habits. From that then I conclude that my purpose is to fashion no novelty and to introduce no falsehood; but to set forth, as well as I may, only what I know from my own observation or believe from hearsay."¹

His excuse of lack of knowledge and want of eloquence arises from the mock-modesty of a learned and witty courtier. He does not forget to remind his reader that his object is a twofold one, to "excite pleasure and to inculcate morals."² He seems almost to be obsessed by the idea that a prophet has no honour in his own country, nor any event in its own day. "Who would dare to set on paper what is happening to-day, or even to write our own names?"³

¹ De Nugis Curialium I., XII., p. 19. ² *Ibid.* III., I., p. 107.

³ *Ibid.* V., II., p. 196.

He goes on his way, however, to set before us "honesty painted in her own colours and baseness in its own crimes."¹ Whether he wrote at Geoffrey's request, or, as he says elsewhere, at the bidding of the king,² his object was to set forth as well as he might what he saw with his own eyes and heard with his own ears. If he acted up to his motto, as there seems no reason to doubt, greater value must attach to the traditions, legends and anecdotes that he has gathered together; and even if they seem to be too strained sometimes for strictly historical purposes, they will but serve to show that Map must have been no less credulous than his fellows.

The *De Nugis Curialium* is divided into five books or *Distinctiones*, and was written hurriedly and by snatches² amid the distractions and confusion of a disturbed court. He repeats one or two of his stories, and jumps backwards and forwards over a decade. Jerusalem was taken by Saladin in October, 1187, and mention of this "year of unhappiness"³ is found in the fifteenth chapter of the first book or *Distinctio*. In the fifth book we find him referring to Richard I. as the reigning king⁴: that means that this particular section was not written till after 1189. In the same chapter he refers to the death of Henry II. in 1189, and says—"We saw the beginning of his reign and the rest of his life which in many respects was worthy of praise."⁵ In the sixth chapter of the first book he gives an interesting account of the accessibility of King Henry II.; and there he mentions Hugh, Prior of Selwode, as being "already elect of Lincoln."⁶ We know that St. Hugh was made Bishop in 1187. He mentions Gilbert Foliot, Bishop of London, in the first book⁷ and also in the fourth,⁸ and as Foliot died in February, 1187 or 1188, we may take it that the greater part of the work was written while Henry II. was still alive. That he had begun to write earlier than this we know from other parts of the work. For example, in Book IV. chapter XI. he speaks of the election of Hubald, Cardinal of St. Praxide and Bishop of Ostia, to succeed Pope Alexander III. as Lucius III., as taking place to-day (*hodie*). That was 1st September, 1181, and we know that Lucius III. died in 1185. If Map had revised his manuscript thoroughly, he would surely have added a note to

¹ *Ibid.* V., II., p. 196.² *Ibid.* IV., II., p. 140.³ *Ibid.* I., XV., p. 23.⁴ *Ibid.* V., VI., p. 232.⁵ *Ibid.* V., VI., p. 227.⁶ *Ibid.* I., VI., p. 7.⁷ *Ibid.* I., XII., p. 19.⁸ *Ibid.* IV., V., p. 153.

the effect that this Lucius was now dead. We may be safe in assuming that this work was a kind of note-book, which he arranged and extended and partly revised. There is, after all, some order in it, as we shall see from a consideration of its contents; but of chronological arrangement there is hardly any trace.

In the fourth book we find the Epistle of Valerius to Rufinus, which is to be met with in other MSS. as an anonymous production; it has been included even in the works of St. Jerome. This was one of Map's earliest literary essays, and was made public anonymously, with the result that many of his contemporaries denied his authorship. With its insertion in the *De Nugis Curialium* he avowed his authorship, adding the interesting information that it was eagerly bought, copied, and read, and that it had given pleasure to many. "We know that this has pleased many; it is eagerly snatched up, copied with close attention, and read with great delight. Yet some deny that it is mine, but these are of low birth. For they look with envy on the letter, and they would violently take away from it its elegance as well as its author. My only fault is that I am still alive. But I have no mind to amend this fault by my death. In the title I have substituted for our own names the names of dead men; for I knew that this would please; and if I had not, they would have cast away the letter as well as me. Being anxious therefore to take care of this sheet and to prevent its being cast on the dust-heap I shall order it to be kept beside me. I know what will happen after I am gone. When I am dead and rotten, and only then, will this letter take on a flavour of wit, and all its defects will be made up by my death, and remotest posterity will grant me the authority of antiquity, because then just as now old copper will be preferred to new gold. Then, as now, will be a time of apes, and not of men; for, having no patience for the good, they will jeer at the things of their own day. All ages have the same distaste for their own modernity, and every age from the beginning has preferred the past to itself; so that my own time has despised my letter because it could not help it."¹

The reason for the Epistle was Map's discovery that a friend of his was in love. At first he regarded the matter lightly, but finding that his friend was in earnest he tried to dissuade him from marriage.

¹ *De Nugis Curialium* IV., V., pp. 152-3.

As his friend turned a deaf ear to him and closed his doors against expostulation, he had recourse to writing, "changing our names, calling myself, whose name is Walter, Valerius, and him, who is John, Rufinus—for he is ruddy."¹ Though the humour is somewhat restrained, the reader is reminded of Panurge when he was in a like plight to Rufinus. And just as Pantagruel, Epistemon and Friar John of the Funnels tried to dissuade their friend Panurge, with the help of the Sybil of Panzoust, the deaf and dumb Goatsnose, the fool Triboulet and the Oracle of the Holy Bottle, so Map ransacked ancient fable and history, and even the Scriptures, to support him in his advice against marriage.

The fifth book concludes, as the first begins: Map compares the labours of courtiers with those of Tantalus, Sisyphus, Ixion, and Tityos—and not wholly to the disadvantage of the more famed sufferers. He will not go so far as to say that the Court and Hell are one and the same, but the likeness between them is almost as great as you will find between the iron shoe of a horse and a mare.² Though he strings together some stories relating the crimes and follies of courts, his diatribe must be discounted; for the brilliance of the men and the life of the Court made a very strong appeal to him. He reminds us of Petrarch, who was never tired of praising solitude, though he only loved seclusion as a contrast to the society of Courts: the great Italian scholar spent a great part of his life in actual retirement at Vacluse, but he knew how to trim his sails to the popular breeze. And Map found his Vacluse in his parsonage at Westbury, but none the less he must have had a longing for the fuller and brighter life of the Court, of which he gives us several little pictures, and in which he himself was no inconsiderable ornament.

He describes in two different places, in language somewhat similar, the court of Henry I. He regards it with the eye of Nestor: "if we may believe our fathers, we can say his age was that of Saturn, while ours is Jupiter's."³ His sketch of the English court and kings from William Rufus to Henry II. is of considerable historical value, and we may take it to be a faithful one when we remember his frequent preface and parenthesis that he writes of what he himself has seen. In the fifth book he relates some

¹ De Nugis Curialium IV., II., p. 142. ² *Ibid.*, I., X., p. 10.

³ De Nugis Curialium V., V., p. 210.

stories about Ethelred and Canute, and gives an account of the family of the great Earl Godwin. He tells how Godwin began life in the lowly position of a cowherd's son,¹ but gaining the favour of the king rose to high eminence. Although Map in the previous chapter has claimed to be fair in his account of men and things—he says of an Eastern king, Apollonides, “I have seen this king; I know him and I hate him. I should like my hate to blacken his virtue, but I have never set myself to conceal the goodness of anyone from envy or ill-will”²—in spite of this claim, however, he reflects the common Norman attitude to Godwin in two stories, one of which has been retold by Robert Burton in his *Anatomy of Melancholy*, where Map is called “an old historiographer of ours who lived four hundred years since.”

“At Berkley near the Severn was a nunnery of the value of five hundred pounds, and over the the nuns was a noble and fair abbess. Godwin . . . , desiring not her but hers, on his way past that place left with her a nephew of his, a proper young gallant, as if he had been sick, till he returned; and he charged the youth so long to counterfeit till he had deflowered the abbess and as many of the nuns as he could; and in order that he might be able to have his full pleasure of them when they came to visit him, he gave him rings and girdles and fawnskins gleaming with jewels to be bestowed upon them in the furtherance of his deceitful design. The nephew entered gladly of his own accord on the way of pleasure: since the descent of Avernus is easy, he learns easily and slips into that folly which gives him delight. He is possessed of all the things desired by foolish virgins, beauty, wealth of charms, courtesy; and the devil is busy that each has its due place. He drove out Pallas and brought in Venus; of the sacred church of the Saviour and the saints he made an accursed heathen temple, of a shrine a brothel, and pure lambs he turned to wolves. When the wombs of the abbess and many of the nuns were swollen, the conqueror growing faint and overcome by his pleasure fled, and at once took to his master his victorious eagles worthy of the hire of iniquity. His master at once approached the king and told that the abbess and her nuns were known to all to be pregnant and harlots. Spies were sent out who returned with the news that the

¹ *Ibid.*, V., III., p. 199.

² De Nugis Curialium V., II., pp. 197-8.

story was true. When the nuns were expelled, he asked for and received Berkley from his king—though I should say better, from his fool.”¹

In the next chapter he tells another story of Godwin, which reminds us of Hamlet’s trick upon Rosencranz and Guildenstern. Canute found a stubborn opponent to his power in the great Earl, whom he sought to conciliate by gifts and an offer of friendship. He at last suggested to Godwin that he might go to Denmark and act as regent. Godwin set forth, provided with a letter from Canute to his sister in Denmark. Godwin, with the aid of his chaplain, opened the letter in order that he might find proof of Canute’s faith. He found it bad, for the orders were that Godwin should be put to death, as it was only a silly shepherd who would allow himself to be taken in by a wolf, even though it appeared to help him in the shape of a dog. Godwin’s followers advised him to return, but he substituted for the original letter another which concluded as follows:—“To the bearer, the Count of York and Lord of Lincoln, Nottingham, Leicester, Chester, Huntingdon, Northampton and Gloucester, who long withstood us in Hereford, we are under greater obligation than to any man living, for his hand has brought peace to me, and his courage and wisdom keep the kingdom undisturbed. To him as my most loyal subject I have entrusted the care and order of all Denmark, and I have given my sister to be his wife; and it is my will that ye submit to his rule without debate. Farewell.”²

The whole of the third book is devoted to romance, and the life and customs depicted therein are very similar to what is represented by William Morris in *The Well at the World’s End*, or any other of his prose romances. The first of Map’s romances, telling of the friendship of Sadius and Galo,³ has a point of contact with the later romance of *Artus de la Bretagne*. In *Artus de la Bretagne* Proserpine employs one of her damsels to prove the constancy of Arthur: in the same way Map represents an Asian Queen sending one of her maids to make trial of Galo, of whom she herself is enamoured.⁴

¹ De Nugis Curialium V., III., pp. 201-2.

² De Nugis Curialium V., IV., p. 209.

³ *Ibid.*, III., II., pp. 111-3.

⁴ This is one of the points I should like to examine more thoroughly in seeking support for Map’s claim to a share in the authorship of the Arthurian romance.

The fourth book contains, in addition to the letter of Valerius to Rufinus, several tales and legends, one of which tells of an early Faust, who was content to enter into an agreement with his spirit-visitor, not for knowledge but for wealth. This story of Eudo enfolds another story which has formed the subject of Southey's ballad, *The Pious Painter*. In this as well as in many other chapters we have side-lights cast on Teutonic and Celtic mythology, and we see that Map was no more free from superstition than Giraldus or any other of his mediæval contemporaries. Indeed, this story of Eudo bears some resemblance to a story which Giraldus tells in his *Itinerary through Wales*¹ of a Welshman called Melerius. Amongst many fairy tales scattered through the whole work there is another which has certain points of likeness to another by Giraldus relating to a priest Elidorus.² This story by Map is about an ancient king of the Britons who visited fairyland to be present at the fairy king's wedding, and who returned to his own land some two hundred years after doomed to take part in a wild coursing that was to go on for ever. This Saxon Rip-Van-Winkle and his followers are twice mentioned by Map in the fourth³ and the first books.⁴

"A king of the ancient Britons, by name Herla, was visited once by another king, a pigmy no bigger than an ape. This scrubby fellow came riding on a very large goat. In appearance he was such as the god Pan might be: he had a ruddy countenance, a large head and a flowing red beard. Over his breast hung a dappled fawn-skin; his belly was rough and hairy, and his limbs grew down into goat's feet. With Herla the pigmy had private converse. 'I am king,' said he, 'over many kings and princes, an innumerable and countless folk. As their messenger I come gladly to you, though you know me not. I am proud of the good name and fame that have raised you high above other kings. You are the best as you are the nearest to me in station and in blood, and worthy to have your wedding honoured and graced by me as a guest. Though you know not of the arrangement, yet the king of the Franks is about to offer you his daughter in marriage. Indeed, the embassy will be here to-day. Let there be between us a lasting bond that I first attend your wedding and that you on the same day a year

¹ Giraldus' *Itinerary* Bk. I., Ch. V. ² *Ibid.*, Bk. I., Ch. VIII.

³ De Nugis Curialium IV., XIII., p. 180. ⁴ *Ibid.*, I., XI., p. 14.

after attend mine.' Whereupon he turned his back on Herla and with the tiger's swiftness vanished from his sight. From this meeting the king returned in wonderment to welcome the embassy and grant their request. The wedding-day came, and the king was seated at the feast. Before the first course was served, the pigmy appeared accompanied by many folks like to himself. The tables were full; more sat out of doors than within, in pavilions specially set up in a moment by the pigmies. From the pavilions the pigmies hasten forth to wait upon the guests with vessels of precious stones, vessels rough and unpolished, vessels fashioned with a wondrous workmanship that none can imitate. With dishes of gold and precious stones they fill the palace and pavilions; no meat or drink is served in silver or on wood. Wherever they are sought, they are at hand. And all they serve, whether meat or drink, is their own; nothing of the king's, nothing of any other prince's. From the store that they have brought with them they exceed the wishes and desires of all. The provisions, which Herla had laid up in great store, are untouched; while his servants sit at their ease, neither called upon to wait nor waiting in attendance. The pigmies go round, winning the favour of all. In the richness of their raiment, they shine before the rest like flashing jewels. They weary none either by word or by deed, by their presence or by their absence. In the midst of his followers' entertainment the pigmy-king addresses Herla with words like these:—'As was our pact, Sir King,—God be our witness—I have been present at your wedding. If there is aught can be asked of me more than you see, I shall gladly make it up to the full, if in turn you put not off the honour due to me when I shall call for it.' As no reply is looked for, he betakes himself to his pavilion, from which he departs with his followers about the time of cock-crow. A year later he appears to Herla and asks that the covenant be kept. Herla nods assent, and making provision for the payment of the debt he follows whither he is directed. They enter a cave in a lofty cliff and wend their way in darkness. In a light that seems not of the sun or the moon but of many lamps, they cross to the halls of the pigmy, a beautiful mansion, in all things just such a one as Ovid describes the palace of the Sun. When the wedding celebrations are over, when the debt to the pigmy has been duly paid, leave is given to Herla to return. He and his attendants are laden with gifts and with presents of horses, dogs, hawks and whatever else

seems excellent for hunting or hawking. The pigmy conducts them as far as the darkness, and presenting them with a dog of blood-red colour and of no great size forbids Herla's whole retinue to dismount until the dog should leap from its bearer's arms. With farewell wishes he dismisses them to their own land. In a short time Herla regains the threshold of light and his own realm. There he sees an aged shepherd, of whom he asks news of the queen, his wife. The shepherd, staring in wonderment, replies :— ' My lord, I scarce know your speech, for I am a Saxon while you are a Briton. The name of that queen I have not heard, save it be in the tale they tell, that there was of old among the ancient Britons a queen called by that name, who was wife to King Herla ; and of him it is said that he disappeared in the company of a pigmy at this very cliff and was never after seen on earth. For two hundred years now have the Saxons possessed this land, since they drove out the natives.' The king was struck dumb, for he thought that his stay had been but for some three days. He could scarce sit firm upon his horse, while some of his attendants, forgetting the pigmy's commands, dismounted ere the dog leaped down, and at once they were turned into dust. The king, knowing the cause thereof, forbade any one on pain of a like death to step to earth before the dog had first jumped down. But the dog was in no haste to leap from its bearer. According to one account King Herla was doomed to wander for ever and to share with his troop of retainers in a furious coursing from which there was neither peace nor rest. By many, it is told, has that troop been seen. Some say that it was seen for the last time in the first year of the coronation of King Henry, when many Welshmen are reported to have seen it drowned in the waters of the Wye, a river of Herefordshire. Certain it is that it has ceased to visit our realm as often as it did before."¹

Very interesting are his accounts of the origin of several of the monastic orders, as well as of some sects of heretics, amongst whom are the Waldenses, with whose representatives, at the request of the Pope, Map argued at the Lateran Council held at Rome in 1179. He does not spare the declension of the monastic orders from their early state of purity, and he is least sparing of the Cistercians, as we have already noted. Against a sect of heretics,

¹ De Nugis Curialium I., XI., pp. 14-17.

which arose in France during the eleventh and twelfth centuries, Map repeats the accusation that they worshipped, even to the kissing of it beneath the tail, a black wild cat.¹ He reflects the attitude of his age to the miraculous, telling in particular of miracles wrought by Peter, Archbishop of Tarentaise.² The prevalence of superstition in England at that time is further illustrated by the popular stories which tell of mortals who had married wood nymphs or of "the children of the dead."³ Perhaps the most noteworthy is that which has features in common with the fourteenth century story of Melusina. Every mythology can provide tales of a like sort; they serve as an expression of man's belief that death may be vanquished and the dead restored. The Lamia of Keats' poem is a sister to the Melusina of mediæval romance. We are taken at once into the wide field of folk-lore and the consideration of tabu when we read Map's versions of what were popular legends. I translate that one of his which resembles the story of Melusina.

"Henno with the Teeth—so called from the great size of his teeth—came upon a most beautiful maid at the mid hour of day in a shady grove on the coast of Normandy. Dressed in royal silks she was sitting alone, and bowed down; she was weeping silently, this most fair of creatures, whose very tears were becoming to her. Henno grows hot with the flame of passionate desire. He wonders that a treasure so precious should be left unguarded: she seems like a star that has fallen from the sky and complains of the neighbourhood of earth. He looks around, for he fears an ambush from some lurking-place; but finding none he approaches her humbly upon bended knee, and with deep respect addresses her:—'Sweetest and brightest ornament in all the earth, whether it be that the fairness of thy face, much to be desired, is of our kin, or that God has willed thee to appear to his husbandmen on earth clad in such splendour and thy hair crowned with a garland of flowers, I rejoice; and it becomes thee also to be glad that it has happed to thee to come to earth in my dominion. Ah, me! that I have been preferred for thy service, a glory to thee, that thou with wisdom and foresight hast turned aside to this place, where thou art received with burning desire.' As innocent as the

¹ *Ibid.*, I., XXX., pp. 61-62. Cf. Scottish Historical Review, IV., p. 40.

² *Ibid.*, II., III.-V., pp. 69-72.

³ *Ibid.*, II., XIII., p. 82; IV., VIII., p. 168 (*passim*).

dove she replies, so that you would believe there spake an angel who could win any to her vows :—‘Lovely flower of youth, and desirable light of men, it is no forethought of my own that has brought me hither, but chance has dragged me against my will. In the company of my father, I was on my way to be wedded to the king of the Franks, but our ship was driven by the storm blast upon these shores. When I landed my only companion was she who now stands by you.’ I looked, and behold a maid was at my side. ‘A fair breeze followed the tempest, and with bellying sails the sailors went off with my father aboard. But I know that when they discover my absence they will return to this place in tears. Yet, that wolves may not devour me nor wicked men assail me, I shall abide with you for a time, if you give me your word that no harm shall come to me by you or yours. For it is better and safer that I should trust myself to your care till the return of the ship.’ Henno lends to her prayers no idle ear, but grants to her all that she asks, and carries home the treasure he has found with great joy in his heart, entertaining both her and her maid with unrestrained delight. He brings her into his house and hands her over to his mother’s care. He joins himself in wedlock with this noble maid, a thing of evil, and she bears him goodly offspring. His mother was often at church, but his wife went oftener. In the sight of men she fills the cup of joy of the orphan, the widowed, the needy who want bread, and chiefly to the end that she may check all evil-speaking and malice. But she ever avoids the sprinkling of the holy water, and takes care to go away before the hour for taking our Lord’s body and blood, pleading in excuse for her flight the crowded congregation or the claim of household needs. Henno’s mother observes this ; her just suspicions are roused and fearful of all things she tries eagerly, yet secretly, to search out what this may mean. She knows that on the Lord’s days she enters the church after the sprinkling of the holy water, but flees before the hallowed bread. To know the cause of this she bores a small hole in the chamber of Henno’s wife and lays wait in secret hiding. Early on the morning of the Lord’s day, when Henno has gone forth to church, she sees her step into a bath and from a beautiful woman turn into a snake. In a little, leaping forth from the bath she dons a fresh cloak which her maid has laid out in readiness for her. This cloak she tears to shreds with her teeth and then she returns to her human form. Presently

she attends upon her handmaid in a like manner in every particular. The mother reveals to her son what she has seen. They summon to them the priest, and seize the two at unawares. They sprinkle them with holy water, which rises up in a sudden spout to the chamber roof, and with loud wailing the two leave the entertainment that they have so long enjoyed."¹

The scene of some of his legends is laid in Wales; and though he speaks of the Welsh as his countrymen, he does not hesitate to proclaim their failings. Their manners are the subject of several chapters in the second book.

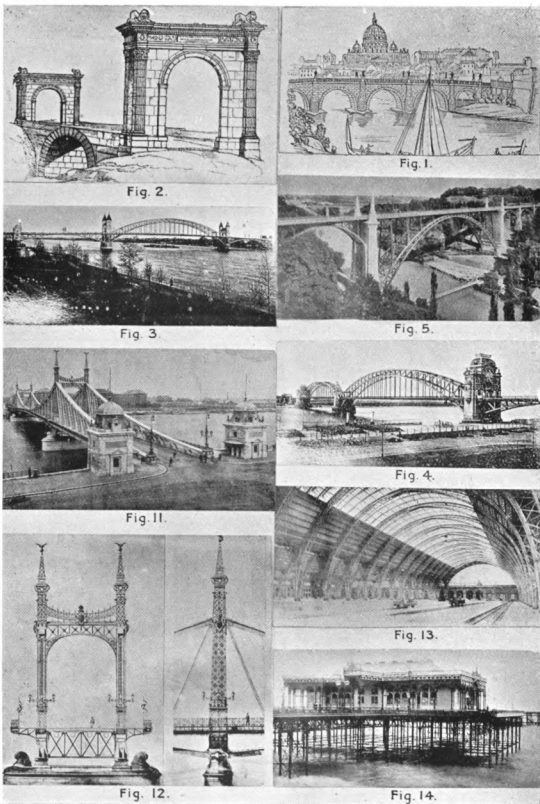
Of folk-tales it would seem to be impossible to discover the origin. Many of Map's stories have much in common with folk-tales of all lands. We find some likenesses between him and Lady Gregory, who has done so much to make the early tales of Ireland known. We find one story, at any rate, in Map² which is very like one in the *Gesta Romanorum*; but the same story forms the subject of a chapter in the lives of Paul the Hermit, in the *Acta Sanctorum* of the Bollandists. Map gives us his authority for some of his writings. We know that he was precentor at Lincoln, where there was a library. He would be able to get written authority there. He was a courtier, and not a stay-at-home courtier either. He saw many things with his seeing eye, and he heard many others with his hearing ear. Gilbert de Lacy is given as his warrant at one time,³ Serlo, Abbot of l'Aumône or Little Cîteaux, at another.⁴ Hugh, Bishop of Acre, is another recognised source of information;⁵ while he even reports what he has heard the king of France telling to his own king, Henry II.⁶ Some of his stories have fallen from the lips of Welshmen,⁷ but he culls from all sources, tongue and pen, living and dead. He retells a story which he has extracted from its place in the fabulous history of Turpin, Archbishop of Rheims, about the Gestes of Charlemagne.⁸ But he does not agree in every particular or detail with those of his contemporaries who have described the same events. For example, while William of Malmesbury makes a foreign monk dream of the death of William Rufus, Map represents the dream as occurring to the king himself.⁹

De Nugis Curialium IV., IX., pp. 168-170. ² De Nugis Curialium II., XV., p. 83. ³ *Ibid.*, II., II., p. 69. ⁴ *Ibid.*, II., IV. and V., pp. 70-71. ⁵ *Ibid.*, II., VII., p. 73. ⁶ *Ibid.*, V., V., p. 222. ⁷ *Ibid.*, II., XI., p. 77. ⁸ *Ibid.*, II., XXIX., p. 105. ⁹ *Ibid.*, V., VI., pp. 222-3.

The whole work is written in Latin, which gives Map every opportunity of parading his acquaintance with the ancient classics and the Christian Fathers. As is to be expected in the work of an ecclesiastic, Biblical references are numerous—though many of them seem to be dragged in, as Browning would have temptation, “by the head and hair.” The style is unequal, and his playful humour does not despise the use of puns, of which there are many—some mere jingles. He sometimes descends or rises—whichever you will—to flowery ornamentation; and when he seems to have been able to snatch a longer interval than usual for the writing up of his commonplace book, we may smell the lamp—though it cannot have the same pungency in our nostrils as it had in Map’s. To the charge which some may lay against him that the fare he provides is coarse or ill served, he is ready with the reply that he only sets the material before his readers. “I am your huntsman: I bring you the wild beasts for you to make choice dishes.”¹

¹ *De Nugis Curialium* II., XXXII., p. 106.

PLATE VII.



The Architectural Element in Steel Structures. By ROBERT
BOYLE, B.Sc., A.G.T.C., A.M.I.C.E.

[Read before the Architectural Section, 6th December, 1909.]

I.—INTRODUCTION.

IN the design and construction of engineering structures more prominence is given to the utilitarian aspect, while in architecture due consideration is in nearly every case given to the æsthetic effect as distinguished from the purely utilitarian. Indeed, the proper conception of architecture implies the æsthetic or artistic element. The modern steel structure has, to a great extent, been gradually evolved from preceding timber and stone constructions. Again, in many steel structures stone cannot be dispensed with. The bridge which is partly of stone and partly of steel is very often the most successful. The presence of stone piers, stone abutments, statuary on piers or approaches and triumphal arches, all enter into the architectural effect in a bridge which is otherwise steel. The particular outward form of a steel structure, its grace of outline and sweetness of profile may give it a beauty which is essentially inherent in the structure, and which is a prominent feature in the æsthetic conception. Just as the Massive Temple was the prominent structure of a bygone age, the Cathedral of the Mediæval era, so the steel structure of the engineer is characteristic of a more modern and more utilitarian age. It will be admitted by all architects and by most engineers that there is room for a great deal of improvement in the æsthetics of many modern steel constructions, and that such structures are susceptible of a considerable amount of architectural treatment. The object of the paper will be to consider how this architectural element originated, how far it may be said to exist, and how it may be developed and applied so as to render a structure at once beautiful and useful. Bridges, as being more monumental than any other steel structure, will receive most attention, but reference will also be made to steel buildings, piers, lighthouses and railway stations.

II.—THE EVOLUTION OF THE MODERN STEEL BRIDGE.

The Romans were the first to apply their knowledge of the arch to bridge building. Their stone bridges are remarkable for their solidity and simplicity, and for the almost universal adoption of the semi-circular arch. Many of the Roman bridges had towers either on them or at their extremities. These were encircled with battlements for defensive purposes and also for collecting tolls. Some of them are remarkable for their excellence of construction and architectural effect. The Bridge of St. Angelo¹ (formerly "Pons Aelius") was built over the Tiber in A.D. 138 opposite the tomb erected by the Emperor Hadrian (Fig. 1). The piers were crowned by eight large columns surmounted by bronze statues, which were destroyed during a Jubilee procession. They were restored in 1668 by Pope Clement IV., and the pedestals consisted of white marble carrying ten magnificent statues of angels. The width was 50' 9", and the waterway 370' 7". Ornamentation of this kind was common. In the "Pons Mammea"² (erected, A.D. 147, restored, 229) on the Teverone, four miles from Rome, the centre arch was decorated with a Roman eagle holding a thunderbolt in his claws, surrounded by a laurel crown.

One of the finest examples is the Triumphal Bridge of St. Chamas (Fig. 2) built in the time of Augustus with a single arch of span 42' 0", and with a triumphal arch at each end of the road-way, the clear width between parapets being 15' 6", and length between triumphal arches 74' 9".

It is a simple and unique example, and was still in a fine state of preservation in the middle of last century.

A remarkable feature of mediæval bridges in Britain was the provision of a chapel and crypt, as in the great bridge at Avignon. The religious fraternity, "fratres Pontis," connected with these bridges belonged to a society called the "Order of the Brothers of the Bridge," and each extremity of the bridge was usually protected by a machicolated and strongly embattled gateway. When a member died during the superintendence of an important work, he was usually buried in the crypt of the chapel. The latter often

¹ "An Encyclopædia of Civil Engineering," by Edward Cresy, 1847, p. 157.

² *Ibid.*

stood over the centre pier, and was rich in architectural embellishment. Thus arose the need of protection for such works.

There is little need now-a-days to build a bridge with defensive towers and abutments. The application of arrowslits or other prehistoric or mediæval devices, as in the Conway Bridge, is radically wrong in principle. The abutments of the Dufferin Bridge at Benares and the bridge over the Rhine at Coblenz have been fortified. This should only be done as a protection in time of war. The defence of towers and gateways became unnecessary after about the seventeenth century.

In 1636 Inigo Jones built a bridge at Llanwast, in Denbighshire, based on Italian methods. It served as a model for some succeeding structures.

It was not, however, till the eighteenth century that any real advance was attempted at bridge building. Nothing had been produced to equal the works of antiquity.

With the advent of John Rennie a remarkable impetus was given to bridge construction, and to him we are indebted for some of our finest bridges. Continental architects and engineers had made much more progress in the production of beautiful structures than had been made in Britain, and Rennie set himself to study the artistic productions of France and Italy, especially with regard to curvature of the arch. Kelso Bridge over the Tweed, consisting of 5 arches 72' span, was built in 1799 by Rennie, and served as a model for Waterloo Bridge,¹ which has been much admired. The chief beauty of the latter is perhaps its roadway, which is perfectly level throughout. The arches are all equal and elliptical and have an admirable effect. The depth of keystone is $1/26$ to $1/27$ of the span. The springing is unfortunately not clear, being hidden by one of the columns. The abutments are of singular beauty, and are provided with a staircase to descend to the river. On each pier are two Doric columns supporting an entablature which runs the entire length. The pier of a bridge, however, is not the fittest place for columns. Their inappropriateness is not so striking here as in the present steel arch bridge at Blackfriars, where each pier is surmounted by a short stumpy granite column which has the appearance of being capable of supporting an

¹ "An Encyclopædia of Civil Engineering," by Edward Cresy, 1847, p. 436.

enormous weight, whereas there is little or no weight to carry. On the continent, especially in France, the sloping roadway on bridges had long been abandoned in favour of a perfectly level one. Considerable attention was given to horizontality of line. There should wherever possible be no break or distortion in the cornice or balustrade. These were features which Rennie sought to emphasize. Perronet, the well-known architect, had previously endeavoured to produce lightness in elevation with economy by making the archivolt of a different curve from the soffit. There were two different outlines, a flat segment on the face and an ellipse or rounded segment for the soffit proper. The two curves coalesce at the crown as seen in the Gloucester Bridge over the Severn, the Pont du Neuilly over the Seine, and the Dora Riparia near Turin. The Wellesley Bridge at Limerick, designed by Alexander Nimmo, had three segmental arches of 70' span, and resembled those built by Perronet. As far as utility and beauty are concerned, the level bridge has much to recommend it. In some cases it is not practicable without increasing the expense of the abutments too much. In other cases it would leave too small a clear headway between high water and the soffit of the arch unless a greater gradient were put on the approaches to the bridge, which again would increase the expense. An emphasis is given to the abutments in a level bridge which satisfies the æsthetic sense, as that is the part where strength is required to take up the unbalanced thrust of the arches. Thus it may be seen that the revival in bridge building, which took place in the eighteenth century, was considerably facilitated by the study and adoption of principles which were already prominent features in continental structures. The art of bridge building made no progress from the time of the Romans till the eighteenth century when Perronet's principles were introduced.

The Britannia tubular bridge was a remarkable success from the æsthetic standpoint, though it was the first bridge made entirely of wrought iron. Since the middle of the nineteenth century a remarkable progress has been made in bridge construction. The development of river traffic has necessitated the use of opening bridges, including swing bridges, lift bridges, drawbridges, rolling lift bridges and transporter bridges. Some of these types are exceedingly difficult to treat from the architectural standpoint, but much might be done in attempting to beautify their appearance.

Within the last few years ferro-concrete has also come to be largely used for bridges.

III.—THE ARCHITECTURAL TREATMENT OF BRIDGES.

Arched Bridges.—The majority of arched bridges are entirely of masonry, and very few exceed 200' span. There are several features in their architectural design which call for special note, and which should be carefully studied in connection with steel bridges, or those consisting of both steel and masonry. When a viaduct consisting of a large number of comparatively small spans is carried over a river or valley the semicircular arch produces the finest appearance. To appreciate this it is only necessary to compare examples of different types. For larger spans of moderate height the segmental and elliptical forms are more appropriate. In large masonry spans it is better to employ a fairly large number of voussoirs. Up to a certain point the appearance is enhanced and the magnitude is more appreciated by increasing the number of voussoirs, but beyond that point the structure loses its megalithic character and becomes too much like one solid mass. Had the bridge over the Dee at Chester, one of the largest single spans of stone, consisted of 100 well accentuated voussoirs instead of having a common architrave moulding round the arch, its apparent size would be greatly increased and its appearance immeasurably enhanced. The accentuation of the voussoirs aids considerably in promoting a conception of the magnitude of the bridge. Whenever possible, the springings should be kept on the same level, and should be emphasized so as to impress the mind with the fact that the thrust is being taken up by the pier or abutment. In arch rings of elliptical outline it often happens that the springing is hidden, as the arch is carried within the pilaster or upward continuation of the pier. It is better in such cases to adopt a pilaster of reduced width, not only because the springing is shewn, but because there is no need for a heavy pilaster on the top of the pier, much less for a huge column such as we have in Blackfriars Bridge. The function of a pier or abutment is to act as a buttress, and it should be proportioned accordingly. Where there are a number of arches of varying span it is perhaps better to keep the crowns all on the same level if the bridge be level throughout, but to vary the crowns or keep the pro-

portion of rise to span constant if there be a gradient on the roadway.

In steel arches there are three main types—

- (a) The flat ended arch in which the rib is continuous and usually increases in depth towards the abutments, of which Blackfriars Bridge is an example.
- (b) The two-pin arch with a continuous rib which is pin-ended or hinged at the abutments only, as in the bridge over the Rhine at Bonn, the Garabit Viaduct and the Zambesi Arch.
- (c) The three-pin arch with the rib in halves and hinged at both crown and springings as in "Le Pont Alexandre III.," Paris, and "Le Nouveau Pont de Smet de Nayer," Ostende.

The highway bridge at Bonn (Fig. 3) is very beautifully proportioned. It consists of an elastic middle arch of 187.2 m. (614' 2") span, from which the roadway is suspended by light vertical hangers, thus permitting the arch to stand out well. There are two side arches of 93.6 m. and one side arch 32.5 m. in span, which rise well up to the roadway and touch it harmoniously. The river piers are appropriately round with conical turrets standing well above the roadway and connected by an arch forming an artistic portal. The parapets are of ornamental design by a moulding of chased copper running along the bottom, and the flat surfaces of the iron portals are covered with allegorical sculpture work. The bridge is not only technically correct, but is a fine piece of architecture. The design was competitive. In 1894 the town of Bonn arranged a competition for the best design of a bridge. The first prize was won for plans sent in by the Gutehoffnungshütte in connection with the contractor, Mr R. Schneider, and the architect, Mr B. Möhring, of Berlin. The bridge over the Rhine at Dusseldorf (Fig. 4) is also a fine piece of work, but the architectural element is less perfect than in the Bonn Bridge, though they are very similar. In the bridge over the Aare at Berne (Fig. 5), which also possesses many good architectural features, the large central span of 114.858 m. (376' 10") is formed of a stiff arch below the roadway abutting near the river level. Beneath it there is a small suspension foot bridge. The side spans, also below the roadway,

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PLATE VIII.

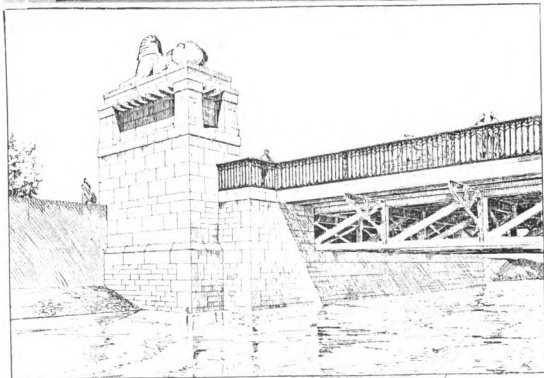
FIG. 6.



FIG. 7.



FIG. 10.

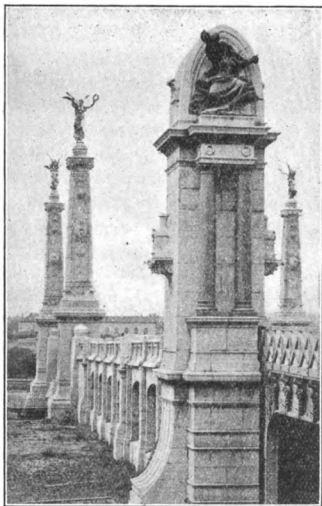


consist of two hinged plate arches abutting on a counterfort on the pier. The difference in level of the springings is not a good feature, but is not so much felt when the side spans are comparatively small, as in this case (34.42 m.). The bridge might have been improved by stopping the pilaster at the level of the handrail, or giving a more massive appearance to the pilasters above the handrail.

It is remarkable that there is not a single example in Great Britain of the fine architectural bridge structures which we meet with on the continent. It does not seem to be that the genius is wanting, nor that the money is in every case wanting, but because there is a disinclination to spend money on that which is beautiful, as opposed to that which is merely useful. A large bridge is a national work. Not only is it monumental in relation to its builders, its designers and its town, but it is monumental in relation to its country. Its influence is so great as always to merit the consideration of not only the engineer and the architect, but of the people.

The Alexander III. Bridge at Paris (Fig. 6), designed for the Paris Exposition, is perhaps one of the finest pieces of bridge architecture which has been produced in any age. It was the joint work of an architectural firm, an engineering firm, and three or four leading sculptors. There are two magnificent pylons flanking the entrance at each end. The proper place for monumental architecture is on the abutments, as in this case, or over all the piers as well, as in the new bridge "De Smet de Nayer" at Ostende (Fig. 8). It increases the æsthetic stability of the structure by concentrating the weight where it is most required. In Italy many of the mediæval as well as more recent bridges had triumphal arches as well as pedestals and statues on the abutments. These added to the beauty and stability of the structure. Incidentally there are many bridges like that over the Dee at Chester which look weak owing to insufficient massiveness at the abutments. The arches of the Alexander III. are covered with an ornamental screen of cast iron, but none of the essential features are hidden. There is just a possibility that the bridge would have looked better without the ornamental festoons, and with a slightly increased ratio of rise to span, but the beauties of the bridge are essentially in itself, its curve and outline, its appropriate sculpture work, its graceful air, its correct proportion.

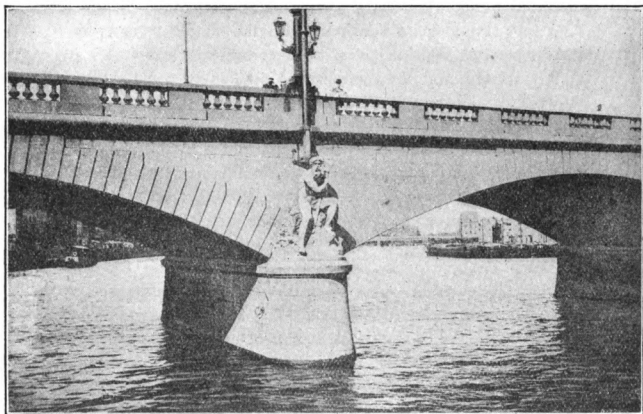
There is a fourth type of steel arched construction, as for example in the Vaur Viaduct, "le pont Mirabeau," the Nile Bridge at Cairo, the Harvard Bridge, and the Dalginross Bridge at Comrie, Scotland. These are cantilever arches, and the first two are constructed on the principle known as the "equilibrated arch," and the last on that known as the "constrained cantilever." The



THE NEW BRIDGE "DE SMET DE NAYER," OSTENDE, FIG. 8.

Vaur Viaduct is remarkable for its purity of form and the inherent beauty of its outline. The piers of the Mirabeau Bridge are very plain in themselves, but each one carries a different bronze statue of an allegorical nature, which was designed by M. Injalbert, one of the leading sculptors of the time. The piers of the Leopold stone bridge at Liège are similarly emphasised by a fine series of human statues (Fig. 9). This sculpture work on piers and approaches is a feature which is practically never seen in Britain, and is comparatively common on the continent.

The bridges over the Nile at Rhodah Island, Cairo, are examples of the successful collaboration of engineers and architects. The designs of Sir Wm. Arrol & Co., Ltd., were accepted by the Egyptian Government in an international competition in 1903. It was considered that the larger bridge from Ghizeh to Rhodah Island (1755' between abutments) would offer facilities for enjoying the scenery and cooler atmosphere in the vicinity of the Nile, and consequently the æsthetics of the bridge had to be carefully considered. The masonry abutments (Fig. 10) are of an Egyptian char-



LE PONT LEOPOLD, LIÈGE, FIG. 9.

acter in accordance with the dignity of the work, and were designed for the engineers by Mr Roland W. Paul, Architect, London. The piers also have been suitably treated. The general effect is graceful, and the parapet with neat and light handrail gives an appearance of lightness to the bridge. Simplicity is the dominant feature in the decorative scheme.

It is remarkable that there should be two such bridges as may be seen over the Clyde at Glasgow Green. These consist of a number of plate girder spans carried on piles, which are so boarded up with timber and painted, that, even at a short distance, it is

difficult to distinguish them from elliptical masonry arches with masonry piers and cutwaters. This form of deception is antagonistic to all ideas of architecture. One of the first great principles in architecture is truth. A thing must not be made to represent what it is not.

It is important that when ornament is applied to a bridge it should not be out of scale with regard to the bridge. The Glasgow coat-of-arms, which is a prominent feature on many of the city bridges, is occasionally out of scale, as on the Great Western Road Bridge over the Kelvin. The treatment of the latter bridge is Gothic in the piers and in the geometrical tracery in the spandrels. The latter is not quite consistent with the simple panels which take its place in the side spans. The central cast iron arches are slightly pointed, and the moulding as applied to a metal rib is subject to criticism. The Lendall Bridge at York resembles the Great Western Road Bridge, and is beautifully symmetrical, but the cornice has unfortunately been interrupted by the arch ring. This should never be done unless the conditions for headroom make it absolutely necessary. Kirklee Memorial Bridge (stone) over the Kelvin, some distance further up, is gracefully proportioned, and the coat-of-arms on the piers is quiet and tasteful.

Suspension Bridges.—The suspension bridge is perhaps more graceful than any other type of bridge by virtue of its own inherent form. The curve of the chain is a perfectly natural one, and is the most suitable for the function of the structure. When a horizontal stiffening girder is added the curve is less flexible and less beautiful, but the bridge may be more useful and more economical. The Menai Bridge continues to stand as an excellent example of a bridge possessing what may be called “architectural scholarship.” Though the land arches appear to be redundant, their form is singularly beautiful and their proportions perfect. They contribute a certain amount of stiffness and lateral rigidity, and would be an aid in the erection, which at least, to some extent, justifies their existence. The Tower Bridge at London is partly a suspension bridge, but it has been constructed on a principle which is radically wrong. It is not what it appears to be. The suggestion of H. H. Statham,¹ Editor of “The Builder,” to

¹ Trans. Jun. Inst. Engrs., Vol. XVI. p. 251.

continue the top horizontal girder outside the towers, so as to show the attachment of the chains, would have been a decided improvement, but as it stands it looks as if the heavy chains were supported by the stonework, whereas the masonry tower simply serves to enclose a steel tower which supports the chains.

The suspension bridge at Shoreham, designed by Adams about 1848, is an admirable structure. Three or four years later a very similar design of his was accepted by the town of Budapest in open competition. This bridge is sometimes said to be the finest in the world. The camber is very marked, and the piers are of an excellent design. The abutments are massive and surmounted by appropriate sculpture work in lions. The Clifton Bridge over the Avon (702' span) at Bristol is a beautiful example, and the Brooklyn Bridge represents a satisfactory treatment of the rigid type.

Parallel and Bowstring Girders.—The Britannia tubular bridge is an outstanding example of fine architectural treatment, though it was one of the first parallel girder iron bridges. The effect of the piers standing high above the girders is distinctly good, and it is rather remarkable that the height was originally given to permit of suspension chains being used as an aid in erection, though they were never required.¹ The parallel girder with inclined end posts is difficult to treat satisfactorily at the break over the piers, where there is a number of spans, but the difficulty may be surmounted by carrying up the pier between by a pilaster. Bowstring girders look better than parallel ones for a single span, though not so much so for a number of spans, as they do not give the same idea of continuity. The hogbacked girder is an intermediate type. The straight, plain plate girder, though entirely devoid of ornament, may yet be inherently beautiful due to the intrinsic beauty of the straight line. The girder should not be made too deep nor have the webs decorated with iron mouldings and stars. It should express solely its purpose, the object of spanning between its piers or abutments. The railway bridge over the Wear, consisting of bowstring girders with strongly curved gusset plates in each corner of the panel, is an instance of æsthetic considerations being allowed to override simplicity.

¹ Min. Proc. Inst. C.E., Vol. CXLV., pt. iii., p. 71.

Cantilevers.—The cantilever bridge is comparatively modern in its development, and, owing to the largeness of some of the cantilever structures, there has been very little attempt to introduce the architectural element beyond what is inherent. The Francis-Joseph Bridge, opened at Buda-Pesth in 1891, is a noteworthy structure from the architectural point of view (Fig. 11). It is, as with nearly all examples of excellent bridge architecture, the product of collaboration between engineers and architects. The engineer was Mr Aurel Czekelius, and the architect Mr Virgil Nagy. An international competition was invited¹ in 1894, but none of the plans were accepted in their entirety. The æsthetics were very carefully considered. Where practical motives suggested the covering of a member, the form of the covering was carefully chosen so that the observer could appreciate the material on the application of which the proportions depended. To be understood the real structure must be observable, and the magnificent archways over the piers show clearly the essence of the principle. The plain flanges of the columns were covered with plating containing cut-out holes so as to show the structure, and at the same time harmonise with the weaker looking constructive trellis work on the other side. This was a case of covering a structure, but not hiding it. The finials are surmounted by globes, on which the “turul” bird of Hungarian mythology is perched with outspread wings (Fig. 12). The handrail harmonises with the lattice work. Attention was also paid to the effect which may be added to a structure by suitable painting. The ironwork of the bridge was painted in three shades of greenish-grey, the handrail and lamps dark, the main construction light, and the archway mostly shaded or gilded, with polychrome in red enamel for the Hungarian coat-of-arms.

Much ornament in a bridge of the magnitude of that over the Forth would be out of place. In structures like this, fitness for duty is the first consideration, and though not pretty, the bridge is grand, imposing, stupendous. The perspective effect of the bridge is very good, and the batter of the piers in the transverse direction assists the beauty of outline. The curvature of the lower boom is an excellent feature.

¹ “The Engineer,” 14th May, 1897, p. 487.

There are three main types of cantilever structures :—

- (a) Those with both booms inclined as in the Forth Bridge.
- (b) Those with horizontal bottom boom and inclined top boom as “Le Pont Doumer sur le fleuve Rouge” at Hanoi, and Connel Ferry Bridge.
- (c) Those with inclined bottom boom and horizontal top boom like the Poughkeepsie, U.S.A.

Class *a* are the most successful in appearance as a general rule, and class *b* least so. Where there is a suspended girder between the cantilever ends, as in most of the large bridges, there should not be too much attempt to hide the break in continuity between the two girders by maintaining the curve of outline of the cantilever, and thereby causing the least depth of the simply supported suspended girder to be at its centre, where the bending moment is greatest. Such a principle is opposed to the fundamental principles of economy, and is not statically correct, therefore not beautiful. It is admissible, however, in the case of very flat arches. The aim in large cantilever bridges should rather be to give little or no ornament with exquisite beauty of form and great perfection of materials and workmanship.

Opening Spans.—There is less opportunity for architectural treatment in the case of opening bridges than in most other types. The Scherzer rolling lift bridge can be satisfactorily treated when the rolling segment and counterweight box are placed below the roadway, as in the Walney Viaduct. In through bridges of this type the only aim can be fitness for purpose.

Ferro-concrete Bridges.—The use of concrete along with steel in modern times has given rise to a new type of construction which, though it may be similar in outward appearance, should not be judged by principles of æsthetics which apply to structures in a more accustomed material. The form and style of a ferro-concrete bridge must not be judged by the canons of taste which are applicable to either a masonry or a steel bridge. Similarly ideas which belong essentially to one type of construction must not be copied indiscriminately into another. We must not build a reinforced concrete bridge in imitation of a masonry bridge, except in so far as the general outline may be concerned. If it be built with an arch ring and imitation voussoirs, it will probably appear

weak, as the newer material can be made of less thickness, and consequently will appear too thin. In one bridge constructed, thin slabs in imitation of voussoirs have been placed on the face of the arch ring. Happily such a violation of principles is not often seen. The style which belongs to the architecture of stone is sure to suggest stone if applied to a material somewhat similar in appearance. In detail there should be a distinct difference. The two very different materials, steel and concrete, have occasioned very great differences in construction when used together.

IV.—ROOFS AND BUILDINGS.

At the present day the engineer and architect come more directly in contact in the erection of large roofs and buildings than ever they have done. Indeed, more of the work now seems to fall within the province of the engineer. The evolution of the modern roof, like that of the bridge, has been very gradual up to very recent times. The simplest and probably earliest construction was that which roofed in an excavation made out of the solid rock or earth. In the time of Vitruvius, roofs were covered with reeds and sometimes a mixture of clay and stones; and according to Pliny the shells of tortoises were also used for the same purpose. The early Egyptian roofs were almost flat, the pitch increasing as the latitude becomes more northerly. The characteristic timber roofs of the middle ages were of high pitch. They were supported on abutment walls and had no horizontal ties. This was exemplified in the roof over Westminster Hall, completed about 1399. The general effect was to impress the beholder with the strength, beauty and lightness of the structure. The modern factory is constructed almost entirely of steel and glass. The French and other common types of steel roof trusses are carried on light lattice girders resting on built up steel columns, while the side covering may be brick filling, weather boarding or corrugated sheeting. The cast iron column is gradually dying out. The general appearance is light and graceful, and there is little to be desired, and little that is advisable in the way of external ornament. The addition of flimsy and elaborate trimmings of cast or wrought iron or of geometrical tracery is seldom an æsthetic success, even in railway stations and other buildings where appearance receives greater consideration.

The steel-frame building or "sky scraper" is the most recent product in the evolution of buildings. The steel frame system originated in the magnificent iron frame cage built by Paxton for the Exhibition of 1851, which is still in existence as the Crystal Palace. It is in America, however, that the idea has been developed by the architect and the engineer. The steel frame building is so essentially different from a brick or masonry structure that new rules are necessary for its æsthetics. There are two main types: the "steel skeleton" building which has ordinary outer walls and an interior framework of iron or steel to carry the floors, interior walls and roof; and the "steel cage" framework in which all walls are inserted as a filling, and which is a perfectly stable and self-supporting structure in itself. A fundamental point to be observed in the æsthetic treatment of all steel buildings is that *the structure must be evident to the intelligent beholder*. Where the outer walls are brick or masonry the position of steel columns should be emphasised by vertical lines and floors by horizontal lines. The internal construction then becomes apparent by the clothing of the structural lines, the eye is pleased and the mind is satisfied.

The employment of iron and concrete in building demands serious consideration from the æsthetic standpoint. The offices of the "Morning Post" consist of a beautiful granite building behind which is an elaborate framework of steel. There are buildings with an enormous floor space carried by a few columns bearing immense loads, and there are buildings in which the reinforcement is so clothed as to reveal the real eloquence of its structural meaning. A construction may be revealed though the structure is covered. The more the mind becomes trained, the more it will take cognisance of internal construction from a few outward details, but some evidence of the structure must appear externally.

Station Buildings.—In the design and erection of stations and station buildings, the services of the architect and the engineer are both required. It is not a question of the engineer completing his design and sending it for architectural treatment. The architect should be consulted at the very outset. The province of the engineer is first of all to give to the structure the correct statical form, as in static correctness lies more real beauty than it is ever possible to gain by the application of extraneous ornament. Having

settled on the form which is theoretically correct, the whole question is one of adaptability to purpose combined with elegance in appearance. We do not want mediæval porches or Byzantine details. The incongruity of engineers' architecture is sometimes remarkable. We find classic columns side by side with pointed arches, not to mention more common instances of blundering.

There are four main requirements in the construction of railway stations :—

The height of the roof must be relatively great.

There must be an abundance of roof light.

The uninterrupted floor space must be a maximum.

The materials must be fire resisting as far as possible.

The appearance from the interior is largely dependent on the form of the roof. The modern steel arch, partially covered with glass, gives a light, airy and impressive appearance. We have an excellent example of this at St. Enoch's. The Midland Station at Bradford is covered by a Warren girder roof. The width is 175' from wall to wall, and there is a row of columns in the centre of the station. The columns are square and are moulded, panelled and fluted, cast in one piece and provided with ornamental caps and corbels. This system, however, is not suitable for the largest roofs. The arched roof is undoubtedly best both for headroom, width and unencumbered floor space (Fig. 13. It is a mistake to overload the small umbrella trusses or cantilever roofs common in small stations with cast iron ornament and scroll work. The Central Station at Newcastle possesses many excellent features, but the imposing portico might be mistaken for the entrance to a ducal residence or a theatre. Though the style is grand, it does not seem the ideal entrance to a railway station. The simple arrangement at the Central Station and St. Enoch in Glasgow, and at Reading Station, is more expressive of the immediate purpose to be served in the arrival and departure of passenger traffic. Princes Street at Edinburgh is undoubtedly one of the finest railway stations from the architectural point of view. The main public entrance is 65' long, and the offices with the central tower give a magnificent effect. The design is classic, and the station is the product of both engineers and architects. Beauty in architecture is derived from constructional fitness, not necessarily from the application of traditional canons. Archæology is not architecture.

The material has also considerable influence on the result. The detail which is appropriate to brick architecture might be too elaborate for masonry construction. The detail which is best for granite might be too simple and severe for sandstone or brick. There should be a meaning for all ornament. An ornate entrance to a first-class booking office, a less ornate one to a second or third class office would be expressive of a particular function. That station building will be the noblest, that construction will be the best which simply expresses in a plain, honest, solid and truthful way the most useful, the most appropriate, the most economical and therefore the most beautiful result. There is such a thing as architectural expression which is at its best when combined with perfection in material and perfection in workmanship.

V.—LIGHTHOUSES AND PIERS.

With structures like lighthouses and piers the same general principles will hold. The beauty of the Eddystone, Bell Rock and other lighthouses is not due to any external ornament, but to their innate beauty of form and expression.

The St. Leonard's Pier (Fig. 14) is of a very artistic construction, and is 950' long, provided at regular intervals along the main pier with alcove shelters. The pavilion is at the shore end and approached by a drive. The toll houses have neat and light roofs with pinnacles. The pavilion is magnificent with light columns and frieze of floral ironwork, the whole being picked out in terra-cotta. The viaduct portion of the East Pier at Dover New Harbour Works combines great strength with sufficient decorative treatment. It is built to allow of the transport of concrete blocks to the breakwater. These have been constructed by Messrs Head, Wrightson & Co., to whom the writer is indebted for particulars.

VI.—CONCLUSION.

In conclusion, it may thus be deduced from the foregoing that the most successful structures, from the æsthetic and economic standpoints, are those which have been the joint product of the engineer and architect; those in which static correctness and fitness for duty have been the first consideration; and those in which the beauty is more inherent than extraneous. That structure will

be the most useful, the most truthful, the most beautiful, which expresses solely its purpose, solely the object for which it is designed and in which all architectural expression, all architectural ornament is such as to emphasise, relieve, contrast or distinguish, special and important points in the general scheme. In these principles alone will consist the unforced application of the "Architectural Element in Steel Structures."

DESCRIPTION OF ILLUSTRATIONS.

FIGURE 1 (Pl. VII.)—General View of the Bridge of St Angelo.

FIGURE 2 (Pl. VII.)—The Bridge of St Chamas, with Triumphal Arch.

Note.—Figures 1 and 2 are reproduced from "An Encyclopaedia of Civil Engineering," by Edward Cresy, 1847.

FIGURE 3 (Pl. VII.)—General View of the Bridge over the Rhine at Bonn.

FIGURE 4 (Pl. VII.)—The Bridge over the Rhine at Dusseldorf. General View.

FIGURE 5 (Pl. VII.)—General View of the Bridge over the Aare at Berne.

FIGURE 6 (Pl. VIII.)—"Le pont Alexandre III.," Paris. This view shows the covering on the face-rib, and the ornamental festoons.

FIGURE 7 (Pl. VIII.)—The roadway of the above, showing the monumental architecture.

FIGURES 8 and 9 are inserted by kind permission of "The Architects and Builder's Journal."

FIGURE 10 (Pl. VIII.)—Masonry abutment of the bridge over the Nile at Rhodah Island, Cairo, by permission of Sir Wm Arrol & Co., Ltd.

FIGURE 11 (Pl. VII.)—General View of the Francis-Joseph Bridge at Buda-Pesth.

FIGURE 12 (Pl. VII.)—Front and Side Views of the archway of the above. These are reproduced from "The Engineer" by kind permission.

FIGURE 13 (Pl. VII.)—Railway Station Halls at Frankfort, Germany.

Note.—Figures 3, 4, 5 and 13 are prepared from photographs kindly supplied by The Gutehoffnungshütte, Oberhausen, Germany.

FIGURE 14 (Pl. VII.)—St Leonard's Pier Pavilion, showing the artistic decorations. From Messrs Head, Wrightson & Co.'s photo.

Competition and Combination in Railway Transportation in Great Britain. By W. R. SCOTT, M.A., D.Phil., Litt.D.

[Read before the Economic Science Section, 5th January, 1910.]

ONE of the most important conditions of social and industrial progress is what has been called "viability"—that is the facility with which persons and goods can be transported from one district within a country to another. "Viability" is an idea which it is worth analyzing. In its primitive form, it consists of the physical configuration of the country—its flatness, the presence of navigable rivers and the absence of mountains or other impediments to transportation. This is the advantage conferred by nature on certain countries, to which has to be added what man has done. First there comes the provision of roads—a convenience which is commonly taken for granted, but which was only built up painfully and after a long interval of time. For instance, as late as the end of the seventeenth century it is recorded that it was more convenient to bring certain goods of moderate bulk from Holland to the East of Scotland than from Glasgow, and still more remarkable that when commodities were purchased in the West of Scotland for Edinburgh they were conveyed by sea. After roads had been provided, there came the improvement of waterways, and then the making of artificial waterways or canals. Towards the end of the first half of the nineteenth century railways had established themselves, and this event constitutes the beginning of a new era in transit, and one that has produced remarkable social and industrial changes. Though the facts just mentioned are well-known it is worth recalling them, because I am convinced it is a great mistake to consider the problem of railway-communication in isolation. To examine it in any degree adequately in its relation to the internal communication in any country, it is necessary to pay due attention to the existing condition, and the possibilities of transport by road, river, canals and also through the coasting trade. In some particular case all of these methods may be possible substitutes, and therefore it would be narrowing the enquiry

unduly to neglect this possibility as well as certain other forms of interaction, more or less obvious.

But before passing to this enquiry, it is necessary first of all to be quite clear as to some aspects of transportation by railway. This may be best observed by examining very briefly how the system as we know it has come into existence. In the days of the Railway Mania, just before the middle of the nineteenth century, the State took the view that it would be to the public advantage that there should be almost completely unrestricted competition. The confusion that resulted was indescribable. Lines were promoted for almost any reason—sometimes for no reason. Had there been capital to carry out the schemes Great Britain would have had a great railway mileage, but would have been ill provided with railway facilities. Parliament interfered, and it was recognised that it would be advantageous to create a moderate number of *railway systems* to weld together the amorphous congeries of distinct lines. This decision had important consequences. It meant first of all a departure from the previously accepted principle of free competition—indeed it was soon seen that railway working was so intimately connected with the safety of life that there were grave dangers in the unchecked rivalry of an immense number of financially weak ventures. It was recognised, however, that the more or less tacit encouragement by Parliament of the formation of railway systems for these reasons would tend to vest the more powerful companies already in existence with certain elements of monopoly, and it has been the trend of legislation to 'take care that, while a monopoly *in name* is created, there will not be the benefit of a monopoly *in actual fact*. It is needless to say, except perhaps in view of great popular misconception on the subject, that the only true monopoly is one where the producer may exact the monopoly-price—that is the price which gives him the greatest net return. Now it is clear that at the time railway lines began to be consolidated, the railway proprietors—being in principle the producers or suppliers of transportation-facilities—would have tended to have sought the maximum revenue for themselves. This object, if carried out in an enlightened manner, would not necessarily have meant high rates for, as often been said, excessively high rates kill traffic, but there was an obvious danger against which Parliament decided to guard the customers of the railways. It is not sufficiently recognised that there were

several methods by which the object sought might have been obtained, and it seems to me that the plan actually adopted was not the best that could have been devised. This scheme originated from the same line of thought as devised the earlier legislation relating to gas companies which was based on the grant of parliamentary powers subject to the condition that there should be a maximum dividend or a maximum price, or both, that is, that more than a fixed dividend should not be paid, nor more than a fixed price charged. As applied to gas companies this system was found to be unsatisfactory; since, once the maximum dividend was being earned, there was not a sufficient incentive to effect economies and improvements in the process of production. In view of this objection the principle of the maximum dividend gave way to the sliding scale, according to which, after the capital earned a moderate return, the economy of production was divided between consumers and shareholders. It is a matter which might be discussed whether a modification of the sliding scale could be applied to the working of railway undertakings, but as a matter of fact, the attitude of Parliament to this industry had been stereotyped before the sliding scale had been largely adopted, and therefore the course of legislation was directed by the idea of a maximum price. This is self-evident in the case of passenger-fares, and the same idea has influenced the practice on which the schedules of goods rates were based as a result of successive Royal Commissions and the decisions of the Railway Commissioners.

It follows then that the dominant characteristic of the progress of railways during the last thirty years of the nineteenth century was the formation of organised systems of transport, operating on a comparatively large scale. How complete this process has been may be seen by taking note that of 1127 separate companies authorised by Parliament no less than 933 have been absorbed into other undertakings. From one point of view this tendency is an example of the movement towards production on a large scale, and it has shown itself in manufactures and also to a very considerable degree in banking. But there are two kinds of such combination, "the horizontal," as it is called—where the amalgamations or extensions are in what is generically the same type of business—and "the vertical," where the types united differ in character but are capable of lending mutual support—as for instance where one firm controls the whole process of production,

say of steel, from the mining operations to the delivery of the finished commodity to its customers. The tendency to horizontal extension of a railway system is obvious. All the more important existing companies represent the union of a considerable number of previously independent enterprises, but instances of vertical extension are not wanting, such as the working by railway systems of docks, steamers, hotels, and the collection and delivery of goods by road.

It would appear that the gradual unification of railways would tend inevitably towards the strengthening of their monopolies, but this does not necessarily follow. Combination in this case has on the whole tended to concentrate competition at certain points, and to make it exceedingly keen. If competition be compared to a stimulus to the physical organism, the effect of consolidation has been to banish it from a number of parts but to re-introduce it again in a more intense degree at the extremities, where another similar organism is encountered. It follows then that the systematisation of railways has not eliminated but has rather defined competition and changed its locality. At this stage it is necessary to consider the nature of such competition and its reaction on the remainder of the system, which might be provisionally described as the non-competitive areas—that is such districts as are not subject to railway competition. When one speaks of the results of competition there may be a reference to the price at which a service is supplied or to the quality of the service. The main function of a railway may be described as the actual conveyance of a passenger or a certain weight of goods through a certain distance. Even in this simplified form of statement, which eliminates for the time being the question of terminal charges in the case of goods and certain other services not, strictly speaking, railway services, it will be felt that there is some thing to be added. In defining the service that a railway supplies in moving a passenger or a ton of goods, account must be taken in both cases of the time consumed in transit and, in the special instance of the passenger, of the surroundings in which he makes the journey. Now referring back to what has already been said as to the relation of the State to railway rates, it is clear that as between competitive points the tendency will be to grant increased facilities—to the passenger by a more expeditious service in greater comfort, and to the consignor of goods by greater speed in certain cases or by

lower rates. It is to be noticed further that railways are not subject only to railway-competition but also to that of shipping; moreover, the progress of invention causes competition to re-appear in those areas that were previously non-competitive as far as other railways are concerned. For instance, for more than fifty years the competition of the high-roads might be neglected; but with the growth of motor traffic there has been a somewhat marked tendency in certain districts towards the withdrawal of both passengers and goods from the railways. The same tendency may be noted in the suburban passenger traffic through the recent improvement of tramway traction. It will thus be seen that the position of railway rates, say in the closing years of the nineteenth century, was subject to many different conditions. It is true that the systems had been consolidated, but by that period their charges were subject to the restrictions imposed on them by Parliament and the Board of Trade from 1891 to 1894. Those rates, however, applied only to the non-competitive areas, and frequently even there did not reach the legal maximum; where there was competition in any of the modes already dealt with rates tended to be further reduced.

All these phenomena had several important results. It has been inevitable that the attention of railway managers should be concentrated on those points where competition manifests itself. Differential advantages are offered in such places to prevent the loss of traffic to the competing agency, whatever it may be. Thus there is the tendency, which is commonly remarked, for the remaining parts of the system to suffer. This tendency, added to the relation of the State to the railways, has it may be suspected not been conducive to the maximum efficiency of railway working. For instance, there is the question of ton-mile statistics which has been so hotly debated amongst those interested in railway management. This method of accounting represents the more or less accurately estimated cost of production of railway service, but it may be guessed that owing to the differential advantages obtained by places subject to competition, a comparison of ton-mile statistics with some actual rates in true non-competitive areas would yield results that railway managers would not consider advantageous to the interests of the proprietors, just as conversely a similar comparison in certain competitive areas might lead to a like conclusion, but for precisely opposite reasons. Further, the difficulty that has

been experienced in making out a case for any increase in rate, however far it may be below the legal maximum, has no doubt tended to limit the initiative of railway officials. They cannot afford to try experiments, hence at the close of the nineteenth century there appears to have been a tendency towards the stereotyping of methods of working. A certain standard, undoubtedly a very high one, of safety and speed had been reached on the trunk lines, and it seemed as if boards of directors and managers were content to merely maintain this, though at the same time another tendency was observable in the incurring of very large capital expenditure, some of which was not immediately remunerative. It is not a little difficult to describe in precise terms the general character of railway working at this period—say about ten years ago. There was undoubted efficiency in some directions, while, as can now be seen, there was a want of efficiency in other directions. Railway working had been standardised. It was reasonably safe and expeditious on the whole. This process of standardisation of methods was the result of the gradual assimilation of an immense amount of experience, and some of the results were arrived at by rule of thumb. Subsequent events have on the whole tended to show that the methods in vogue had not been thoroughly understood and Nationalised. Railway policy, if one may use the word, at this time looked rather *outwards* than *inwards*. Partly through local demands, partly again by a species of megalomania, there was a tendency towards undue capital expenditure in advance of immediate requirements, which was regarded by the adjoining systems as aggressive in its nature, though these systems were affected in many cases by the same ideas. Meanwhile the capital for such extensions, widenings and other new works was readily obtained, and the shareholders, who were receiving dividends which were below the level of those paid a decade or two before but were in advance of what had been divided in the immediately preceding years, are quiescent. It is true that a few of the more far-seeing recognised that many of the whole group of railway proprietors were interested in a number of lines and that they tended to suffer by the policy of adventure which had been begun. It needed a time of declining profits to make this point of view explicit—a period which was reached early in the present century. This represents the outward aspect of the situation in the later nineties. It distracted attention from the

internal organisation of transportation. The whole mode of operation, apart from the engineering aspect which was on the whole admirable, had not been completely adapted to the stage of evolution that had been reached. Physically or geographically the distinct lines of the fifties and sixties had been systematised, and thus in one way the idea of the production of transportation on a large scale had been reached ; but, in the organising of it, in many respects the methods were those of production on a small scale, and thus it seems probable that a possible economy was lost to a considerable extent. Some of the gains of large scale production were secured as a matter of course. Obviously the union of a number of lines under one management resulted in savings in the interchange of traffic and also in an economy of time. But it may be doubted if the essentials of the organisation of production on a large scale in railway working were at that time even formulated, much less realised. Time would not suffice, nor do I desire, to enter on the somewhat technical controversies concerning large versus small waggons or ton-mile statistics, but it should be added that there appears to have been a want of a really scientific appreciation of the most beneficial kinds of capital expenditure, of getting the greatest advantage and fullest use out of the existing plant, and thereby reducing the cost of production of the services which a railway system supplies.

The stern logic of events soon began to press on railway companies. As is well known, for several years past working expenses have begun to increase, and a great part of the increase appears likely to be permanent, wages are higher, the cost of fuel also on balance has been greater, and in England there has been the burden of local rates which has been growing. As a result of these and other causes the companies discovered that they were obtaining little benefit from the growth of traffic receipts which had continued for a considerable period almost without interruption until the late commercial crisis which has been followed, as in other like disturbances of credit, by severe depression. It would have been disappointing to railway proprietors that in the previous time of good trade profits had not expanded, it was more than disappointing when dividends showed contraction, in view of the great capital expenditure that had been incurred. The phenomenon in fact that resulted was a special form of over-production, modified according to the peculiar circumstances.

Ten or twelve years ago when profits were considered to be good in view of the high-class security (as it was then regarded), capital flowed freely into the improvement and extension of railways. Much of that outlay could not be immediately remunerative, and therefore the management of railways endeavoured to divert traffic to increase receipts on the remainder of the systems. It may be conjectured that much of this gain was only obtained at a disproportionate outlay. Add to this the rise in the cost of production of railway service, as already explained, and it will be seen the outlook became overcast. Capital that had recently been attracted towards railway enterprise began to avoid it, and the remarkable situation arose that railways began to find their financial position a difficult one, many of the companies procuring new capital by a debit on their capital accounts, arranged by a floating or unfunded loan from their bankers. In enterprises of such magnitude the position was a most unfortunate one. Perhaps a few words may be pardoned in order to make the causes and results quite clear. Of late issues of railway capital, in the sense of debenture or share capital, have been comparatively few. But this does not mean that the expenditure of capital by the railways has been confined to the sums realised in this way. Further funds have been secured by loans or overdrafts from bankers, and such moneys constitute a floating debt. It is almost needless to add that a floating debt, in addition to a large debenture debt, is unsatisfactory from the point of view of sound finance, and it might in certain circumstances become an element of serious danger. Regarded in immediate relation to the events of the years immediately before, the financial stringency represents the beginning of a natural process of recuperation. But in another industry that process would be made actual by a recovery in the price of the commodity when the period of over-production had begun to pass away. Owing to the restrictions imposed on railways by the State, this direct and easy method of recovery was not available. Further, as affecting the customers of the railways—that is, the consumers of what the railways supply—this situation if long continued would result in very grave inconveniences indeed. Financial ease prudently exercised is a condition of the highest degree of industrial progress. If railways should experience difficulty in this department there would be a tendency at some future date for the service they render to be less efficient and less well developed than it otherwise

would have been ; and therefore those who use railway facilities would stand to lose an advantage they otherwise might have obtained. It might perhaps be said that after all this was to be expected since a period of over-development must be followed by one of under-development, and that taking the two eras together they should be averaged. This, however, is to neglect the position of the railway-shareholder, and no solution of the problem is adequate which will not at one and the same time secure reasonable advantages to the customers of railways and a reasonable return on the capital employed in providing railways. If the former class suffers the latter will eventually feel it, if on the other hand existing capital is unremunerative, new capital will not be found to the extent required, and the users of railways will suffer in the long run. To the economist or financial expert this statement is self-evident, but I fear that to others it seems a paradox. The reason I think is that instead of regarding all exchanges—and transportation is an exchange where the railway gives a certain service for a certain payment—as in the main benefiting both parties to the exchange there is a popular impression that where one party must carry on a certain business he can be forced to reduce his price and that the benefit he loses is transferred to the other member in the exchange. But in the long run this will not be so if the capacity to render the service with the best efficiency is impaired. Let me illustrate this point from my own experience. There was a gas-work owned by a municipality where the rates were below those of similar undertakings in the district. The inhabitants of this particular town had insisted on having their gas at such a price as would pay current expenses without providing for repairs or depreciation. The mains were leaking and the works were in a lamentable condition. One building—a retort house I think—was carried on arches and the brick in these were eaten away and in one case a pillar had suffered so much that it was supported on a single brick which was loose! Needless to say a time came when the whole place had to be pulled down and completely new works built.

It will be seen then that as the railway situation existed a few years ago it had begun to present serious difficulties. The shareholders, suffering from reduced dividends, at length became restive and began to put pressure on the boards of directors. It was felt, perhaps not very definitely, that the scale of operations was being

carried on a larger and larger sale, and that the economies that should have resulted had not only not been realised, but results, from the point of view of profits, were showing a retrogression. Those who found new capital in the nineties, even at what were then considered bonus prices, had special reason to be dissatisfied, some of them not obtaining more than two per cent. on their investment. Needless to say those who had purchased in the open market were in a worst position. At first the discontent manifested itself in a variety of suggestions from individual stockholders, which were urged on the respective boards. Many of these suggestions related to improved methods of working, but at first there was no organisation amongst the stockholders which would enable the protests to be made effective. The mechanism that was needed for this purpose was brought into existence by the formation of Railway Shareholders Associations both in England and Scotland. The criticisms and proposals for improved organisation were generally met in public by a *non possumus* attitude on the part of the Boards; but, it may be suspected that behind this, strenuous efforts were being made to improve the situation. This may be gathered from a careful study of the speeches of railway chairmen, many of whom, while endeavouring to show that a particular proposal was impracticable or inadvisable, pointed with great satisfaction to some other economy accomplished in a different direction. It may be guessed that when railway officials began to make attempts to take stock of the situation as a whole, they found that the great gains of true large scale operation would be minimised by the exigencies of the competition for traffic. All railway chairmen deplored the consequences, all professed themselves ready, even anxious, to make terms with their rivals, but for some time no terms were actually made. Meanwhile distinct series of events co-operated in bringing about a change of spirit. The shareholders associations were beginning to exert an influence; and further anticipated additions to the cost of operation made action imperative. The creation of conciliation boards was expected to produce an increase in traffic expenses. Fuel it was thought, rightly or wrongly, would tend on balance to be dearer. Experience had shown that increasing receipts, great as these had been, had not sufficed to meet the expenses that had advanced rather more rapidly and were likely in the future to grow even more quickly. Once the problem was faced a solution was sought

and found in the working agreements which have largely occupied public attention of late—a phenomenon which represents the latest phase of the situation.

In endeavouring to estimate the consequences of this important movement in a scientific spirit, the first step is to know the causes of it. In the previous analysis we have seen that this result has been determined by a long process of evolution, and further, that this phenomenon has not manifested itself now for the first time. In the past there have been periods of railway extension, followed by amalgamation and consolidation, and the latter phase was accomplished by as much, or even more, comment on those former occasions, than it has been in the present instance. Moreover to the careful observer there were indications ten years ago that some such movement might be expected from the vesting of the railway property of the London and South-Eastern and of the London, Chatham and Dover Companies in a joint managing committee, elected by the two companies, which committee divided the net receipts in certain specified proportions amongst the two companies. This arrangement received the assent of Parliament. The result has been an improvement from the point of view of the public in so far as the physical condition of the lines has been made more satisfactory. As yet, however, the stockholders have not gained from the point of view of divisible profit, though it is difficult to determine how far that result is attributable to new restrictions arising out of the struggle to obtain the act authorising the union, how far it was due to general causes adverse to railway undertakings generally. Perhaps indeed from a broad standpoint this union should be regarded rather as belonging to the period of extension and expansion than to that of consolidation, though it appears to fall under the latter, since its effect has been to produce an immense quantity of re-construction of the lines and works affected. A somewhat similar operation, of the same period, was the leasing, by the Great Southern and Western Railway of Ireland, of several lines which adjoined it and which extended to the westward. It may be added that, also in Ireland, there was a curious series of acquisitions, where there was no element of competition, by the Midland Railway of England acquiring control of the Belfast and Northern Counties and also of the Donegal line, the latter being narrow gauge.

The latest series of understandings amongst railways is very

recent. In Scotland there has been that between the Highland and Great North of Scotland, followed by another, likely to be of more importance, between the Caledonian on the one side with the Glasgow and South-Western and on the other with the North British. In England there is what is known by the Triple Alliance of the Great Eastern, the Great Northern, and the Great Central. In this case it will be remembered that a bill was promoted for a fusion of the three companies, but it was withdrawn on the decision of the House of Commons to refer the consideration of it to a committee which was to report on the whole question, and the companies felt that they would be burdened with the expense of an enquiry which would be most costly and would extend far beyond the area in which they worked. It is understood, however, that many of the economies anticipated are in process of being obtained without Parliamentary sanction. Then again yet another agreement for the pooling of competitive traffic has been concluded between the London and North-Western and the Midland Companies, while the former has an understanding with the Lancashire and Yorkshire. Finally, in Wales the Taff Vale Company is again proposing to unite with the Rhymney and Cardiff Railways—a bill for this purpose having been re-introduced within the last few days.¹

Let us consider for a moment what these various understandings mean. In Great Britain competition at those points where there was competition from other railways, will be greatly mitigated for a time. In dealing with this question we must be careful to avoid the common danger in treating phenomena of this kind and speaking as if what seems likely to happen at the moment would be a permanent condition. Several times in the past it was supposed that railway competition had been suppressed for all practical purposes; and events, as they generally do with their peculiar irony, showed the futility of the prophecy. At the same time just because the tendency has reasserted itself, one should be careful not to dogmatise and to assert categorically that there will be this re-emergence. All that can be said is that we are experiencing a phenomenon similar to that of the sixties and early seventies, then it was a systematisation of railways, now it

¹ Since this paper was read the agreement between the Great Western and London and South-Western has been announced.

might be described as this process on an extended scale. The bodies now working in harmony in England touch each of them their rivals at many points and it is not improbable that, sooner or later, an even more intense competition may break out at those points. In this connection Mr W. M. Acworth has made an interesting comment in describing the effects of the agreement of the Great Northern, the Great Eastern and Great Central, when he says "that competition in the East of England will be absolutely non-existent from the Channel to the Tweed."¹ In a sense this is true. At the same time such an assertion is likely to mislead. First of all, as just shown, there will be competition when this triple alliance meets the dual alliance—that is the Midland and London and North-Western companies—and that competition may in the future become exceedingly keen. It follows that what in effect has happened is *a re distribution of the competitive points*. It would seem then that some places, which previously had competition, will cease to have competition. It is natural, almost inevitable, to add "and thereby will lose the advantages of competition." But does this necessarily follow—that in fact is the crux of the whole question? It is important to consider this point with care. Competition, in the special case of goods traffic, often produces remarkable results. In the very recent past some enterprising railway canvasser has often discovered that the company he represents can carry goods between two stations which are usually served by a rival route. The haul in his case is very considerably longer—I have known it to be twice the distance—in his anxiety to attract traffic he quotes a slightly lower rate than that of the shorter route, and he may get the consignment. The superfluously long haul will not be an isolated case, the company attacked will retaliate, and thus there is the waste of unnecessary train mileage. In fact, at the competitive rate the cost of production is needlessly high. The price received for that particular railway service is reduced; and, absurd as it is, in order to reduce the price the cost of rendering the service is increased. Now, under a working agreement, it becomes possible to convey the goods by the most economical route, which will be also the most expeditious route. This, however, is only the beginning of the economy. There is a saving in

¹ Railways and the State, Reports of British Association, 1909, p. 781.

the cost of obtaining the traffic ; and it is to be expected that in time there may be possible the very great saving of true operation on a large scale by handling the traffic to better advantage. This is the possible and attainable advantage. Much is said from time to time by persons financially interested in railways as "to the restoration of unduly low rates." But where a competitive rate has been established, as between two railways, experience shows that it is unlikely that it will be increased again, unless possibly in a general and comprehensive revision of charges by some statutory authority. Therefore it may be inferred that an increase of rates that have been in existence for some time is unlikely. In one important case the companies have disavowed in the most definite terms any such intention, and if they were unwise enough to forget their undertakings, Parliament would be likely to intervene. It follows then that what these working agreements are likely to mean is not "the absolute non-existence" of competition in the sense of an increase of rates, but *the fixing of the rates established by competition for some time to come*. Within the next few years the trader whose business is in an area which was before last year a competitive one, will not as a rule pay more, he will obtain, or should obtain, a more even service because more rolling stock is available and he gets his consignment by the most direct route. What he loses is a contingency, namely the possibility that if the competition had continued he would have obtained further reductions or other advantages in the future. But there is an obvious limit to this process. Looking ahead, not for a short period but for a long one, the restriction of the inflow of capital would impair railway efficiency and the systems as a whole would tend to suffer in the future, and not only the stockholders but those using the railways and those employed by the railways would be affected prejudicially. It is to be hoped that improvements in the mechanism of transportation will continue to be invented, and some of these will probably involve large capital expenditure. As an instance in point, the possibility of main line electrification may be mentioned. These developments are not for the immediate future, what is most pressing is for the railways to utilize their existing resources in the most scientific manner which may involve a process of reorganization of their methods. The time that will elapse will allow of financial recuperation. The reputation of railways amongst investors should become re-estab-

lished once evidence is given that the new methods of operation are producing the economies expected. It is true that such economies will be only in part available for the shareholders. A proportion is already earmarked for increased expenses, a considerable part of which is allocated to increased wages to the staffs. It follows that the legitimate benefit of a better understanding amongst the railways seems to go mainly to the shareholders and in increased expenses. The user of railways appears to be left out in the cold. What he is most conscious of at the moment is the annoyance of the change, which like all alterations results in inconvenience for the time. Judging by past experience it seems likely that the customer of the railways will receive some compensation in an improved service. It has to be remembered too that traders, where there was active competition, have been obtaining very great concessions. In the main it seems likely that these will be retained to them. Moreover the reverse side of the situation must be observed. Suppose things had been allowed to continue to drift, some at least of the increased expenses are certain, and therefore the recent fall in the profits of railway-working would have continued and even become more marked. Driven by necessity, the companies would have attempted to re-coup themselves by obtaining the sanction of the railway commissioners to advance rates where these were below the statutory ones. In certain circumstances that might have resulted this plea would not have been resisted, and therefore customers of railways, more especially those in the non-competitive areas, would have been in a less favourable position than they are at present. Such a result would have been little short of a calamity—not through the increase of rates, but by an *absence* of an increase of efficiency. Working agreements, subject to all the necessary safeguards, may receive a qualified approval only, and in so far as they conduce to more scientific operation. Thus I close with the same thought with which I began, namely, that “viability,” which in this connection has become a satisfactory system for the interchange of goods by railway transportation, is an important acquired national advantage. It must be safe, expeditious and cheap in relation to its quality. The key-note is a truly scientific system of operation. The railway interest, including in that term shareholders, directors and managers, seem to be standing on the threshold of an unique opportunity, greater perhaps than any other in the history of rail-

ways, if they can take advantage of it to the full there are hopeful prospects of a return of prosperity. This will affect the employees and the shareholders first, but in time the customers of railways will share in it for obvious reasons.

The sum of the whole matter then, as I regard it, is that if one is asked what is likely to be the result of these railway working agreements and understandings? no definite answer can be given. I have shown the chief causes that led to this result and the outcome of it—its further consequences will depend on how it turns out. The safeguard—and this is the hopeful element in the whole situation—is that for the companies to benefit there must of necessity be an increase of efficiency. If further that efficiency is attained, in time the resulting economies will be diffused, since it scarcely ever happens that a producer, or indeed any worker, becomes more efficient without being an advantage to others besides himself.

The First Quarto of Hamlet—a literary Fraud.

By JAMES D. FITZGERALD.

[Read before the Historical and Philological Section,
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THE First Quarto edition of *Hamlet* has received an extraordinary amount of attention at the hands of the critics, both in this and in other countries—attention that would never have been bestowed upon it, had it not, almost from the date of its discovery in 1823, been hailed as likely, from some of its peculiar features, to prove one of the links in the literary evolution of the tragedy. For various reasons, it was assigned to an earlier date than the versions more familiar to us. Some passages of the Quarto, which had nothing corresponding to them in the accredited copies of *Hamlet*, were thought to show traces of an older Elizabethan tragedy attributed to Thomas Kyd and regarded as one of the original sources of Shakespeare's play; while the comparative shortness and the disorderly condition of the Quarto text seemed to favour the idea that it was a first rough draft of Shakespeare's *Hamlet*, supposed to have been revised and enlarged by him at a later date. This view of the relationship between the two texts has always been the popular one, yet almost from the first there have been scholars in whose eyes Q1 has never seemed more than a fraudulent and imperfect copy of the longer play, containing little if any original matter, and throwing little if any light upon the development of the tragedy. Such was the view taken by Collier and Mommsen, and advocated more recently by Richard Grant White. Such was also, at first, the opinion of the editors of the *Cambridge Shakespeare*, who asserted that the differences between Q1 and Q2 are only such as might be expected between a *bona fide* and *mala fide* transcription of the same play. But in the *Clarendon Press* edition these scholars changed sides, deserting what is sometimes called the *mutilation theory* and adopting the more popular *theory of revision*, to the effect that Q1 should be held as representing an older play in a transition state, while it

was undergoing a remodelling, but had not received more than the first rough touches of the great master's hand. Furness, in the *Variorum Shakespeare*, quotes this final opinion of Messrs Clark and Wright last of all amongst his authorities on the subject, thus giving such prominence and approval to their second verdict that few have ventured boldly and directly to challenge it. Professor Dowden, however, in his introduction to the *Arden* edition of *Hamlet*, writes as follows: "For my own part, repeated perusals have satisfied me that Shakespeare's hand can be discovered throughout the whole of the truncated and travestied play of 1603. With the exception of the following lines (here omitted) I see nothing that looks pre-Shakespearean, and I see much that is entirely unlike the work of Kyd." Starting, therefore, under cover of such an opinion, the opinion of one who holds no brief for either theory but who shows us plainly how far he has been forced to go without committing himself to any extreme or positive conclusion on the matter, we must find courage to reopen the whole question, endeavouring to make a more thorough comparison of the two texts than any of the critics have as yet been able to undertake, it may well be for want of the time imperatively demanded for such an investigation. Moreover, the writer is convinced that what may seem a very mechanical method of comparison will yield the best return for the labour to be expended on the task. Repeated perusals of the Quarto—mere perusals however careful—have not led to results that can be successfully urged upon the consideration of others. Something more is wanted than careful reading, and something else is wanted than literary acumen and finely balanced judgment. For there is evidence on the subject that appeals to common sense, though it cannot be formulated without a large expenditure of time and labour.

To one who would start fair on such an investigation, and who would like to form an independent and impartial opinion on the subject, a very homely plan may be heartily recommended. It is of the utmost importance that every student of the Quarto should have, from the very first, a correct idea of the large amount of Shakespeare's work that is to be discovered in the text, and this information may be acquired as if it were a simple question of lineal measurement. For it would be an easy matter to show to the eye, by printing the texts in parallel columns *and underlining what*

is common to both, how much of the Quarto may rightly be claimed for the poet; and if this simple expedient had been tried immediately after the discovery of the pirated edition in 1823, such a view as that taken in the *Clarendon Press* would have been seen at a glance to be exaggerated and incredible. Every student, therefore, who cares to gain the right stand-point for further enquiry, should begin by underlining upon a copy of the Quarto, running as it does to not much more than two thousand lines, every word it contains in common with the current text. Let him then go on to compare his underlined text with the text of the play, on the working hypothesis that all he has underlined in the Quarto belongs to the true and perfect copy of the tragedy; and let him stick to that hypothesis till he finds it will not work. We are assured that that hypothesis will serve him well in his comparison of the two texts from first to last. He will never be tempted in his analysis of any passage whatsoever to think of the current text as dependent on or secondary to the Quarto. On the contrary, he will find that the Quarto is to be explained throughout by reference to the current text from which it is derived, and that this relationship is never reversed. He may at first be occasionally seduced to dally with the idea that a third text may once have existed on which both the Quarto and the current text may have been based. But that idea will not force itself upon his notice, and indeed it ought not to be dallied with—much less to be entertained—unless the strongest evidence can be adduced to substantiate it; and evidence of any kind in its favour will be hard to find. The current text it is that originates and permeates the text of the Quarto; it underlies and interpenetrates it throughout; and of any third text there is no trace at all. The Quarto has recorded as much of the true text as it could copy or remember. Where copying was impossible, or where memory failed to fill the gap, recourse was had to fabrication unblushing and undisguised. Had this element of literary fraud been detected and exposed, as it might have been long before our day, criticism would have been saved much ingenious but fruitless speculation.

In entering on his task of comparison, a student might do well to limit himself to the 300 lines at the end of the Quarto that correspond to Act V. of the longer version. On making such a beginning, he will probably take it for granted that Shakespeare's

proportion of the literary matter will be found to taper away towards the end of the Quarto to a very small amount indeed. But he will very soon discover that these 300 lines are a mere *réchauffé* of Act V., two thirds of which is rendered in Shakespeare's own words and phrases. Wherever these fail, they are patched together by a peculiar jargon of vulgar monosyllables and dissyllables, which rarely commit the Quarto to an original idea or dramatic detail. By this "pitiful transformance," moreover, as we might have expected, many of Shakespeare's finest passages are completely ruined. Thus, to take one melancholy example, Hamlet's speech at Ophelia's grave,

What's he whose grief
Bears such an emphasis, whose phrase of sorrow
Conjures the wandering stars, and makes them stand
Like wonder-wounded hearers? This is I,
Hamlet, the Dane,

is reduced to,

Beholde 'tis I, Hamlet the Dane ;

and the words, "What's he that conjures so," are pitchforked into the mouth of Laertes ; so that the Quarto dialogue runs thus :

Laertes. What's he that conjures so?
Hamlet. Beholde tis I, Hamlet the Dane.
Laertes. The divell take thy soule.

But while so much is ruined or lost, many of the poet's classical phrases are, in these 300 lines, preserved intact or nearly so. Take as samples: "The toe of the peasant comes so near the heel of the courtier that he galls his kibe : Now go to my lady's chamber, and bid her paint herself an inch thick, to this she must come : I tell thee, churlish priest, a ministering angel shall my sister be when thou liest howling : There's a predestinate providence in the fall of a sparrow : I have shot an arrow o'er the house and hurt my brother : I'll be your foil, Laertes : I am more an antique Roman than a Dane." Who is the author of sayings like these? How do they come to be found both in the perfect copy and in Q1? Did Shakespeare pick them out from among the rubbish of the Quarto to shine like jewels re-set in his great masterpiece, or were they stolen from his play to receive so vile a setting in the pirated edition? This is the fundamental question we must keep on asking throughout the whole of our investigation. But after all,

should we trouble so often to ask a question so futile? If the Quarto is a derivative, it cannot also be an original; if it is later in date than Shakespeare's play, it cannot also be earlier; and if at any point it proves a dishonest or disreputable copy, it must be held as "suspect" from beginning to end—we feel safe in prophesying that it will never belie its evil reputation. And while we are not unmindful of what has sometimes been said to the contrary, we know of no line of argument that should be permitted to distract our attention from the alternatives at issue.

Our demonstration of the fact that the Quarto is a fraudulent copy of the play could be made complete only by a full analysis of the two texts we are now comparing. In such a paper as this, however, we can give only illustrations selected from the evidence as a whole, though we must try to make these illustrations as numerous as possible, choosing them from all parts of the texts in question. And if we have begun this discussion by an examination of the last Act of the Quarto, that has been done partly to show that it hardly matters where we begin. To know the Quarto thoroughly at any point is to know it everywhere, for its characteristic features are strongly marked and everywhere the same. It is thus in harmony with our purpose and plan that, before passing from our analysis of the last Act, we should refer to the evidence it affords with regard to the omissions that characterise the Quarto—omissions, be it remembered, that reduce the copy as a whole to half the size of the complete tragedy, and compel the 300 lines at the end to do duty for the 700 lines that make up Act V. of Shakespeare's play. If this general deficiency of the text had been kept in mind, a mistake in method, not at all uncommon in the history of criticism, might easily have been avoided. Special omissions of the Quarto, as in the case of one of Hamlet's great soliloquies, have sometimes been dealt with apart from the more inclusive fact of that general deficiency of the text which makes the argument from silence so very precarious to lean upon. The presumption that should rule, where we have no direct evidence on the subject, is that any particular omission may rightly be explained on the same principle as the general deficiency of the text. And when so many of the omissions of the Quarto can be proved to be due to ignorance, forgetfulness, or carelessness, it becomes increasingly difficult to believe that any omission whatever is to be accounted for on other grounds. But we need not hesitate to

assert that direct evidence on the subject of any notable omission is seldom if ever lacking; for the text, as we have it, can be subjected to cross-examination, and forced to make confession of its own shortcomings, to bear witness to its own lapses and deficiencies. Sometimes the omission is due to sheer stupidity, and the blunder can be detected at once. When for instance, in the last Act of Q1, line 2108, Hamlet says to the King, "Lies thy union here?" we note that the unfortunate text has forgotten to make any previous mention of the "*union*" and has dropped a passage of 12 lines, to be found in the perfect copy. The greatest lapse of all, however, in Act V. of the Quarto, is the omission of Hamlet's confidential talk with Horatio, in which he recounts his escape from the custody of Rosencrantz and Guildenstern, and his sending them to death while he returned to Denmark. To this omission we shall again refer. In the meantime it may be enough to say that it seems more than probable that Shakespeare had composed the whole passage before the Quarto rushed dishonestly into print, or how comes it that the Quarto has got hold of the last lines of this very conversation,

Hamlet. Beleeve mee, it grieves mee much Horatio,
That to Leartes I forgot myselfe?

It has got hold of these lines, and introduces them as the very first words Hamlet is made to speak in the play after his quarrel with Laertes at Ophelia's grave, bringing them thus into immediate and stupid conjunction with these other words of angry and bitter disappointment,

But stand away,
A Cat will meaw, a Dog will have a day.

For so it happens that, in the text of the Quarto, nothing intervenes (between the unseemly wrangle with Laertes at the grave of his sister and Hamlet's wish for reconciliation) except the King's hypocritical hope that the two may be made friends again and the weak Queen's hackneyed petition, three times sent up from the pages of the Quarto, "God graunt they may." The prayer of the Queen certainly finds most instant response; it is answered in the very next line by Hamlet's expression of regret to Horatio. And this immediate sequence of prayer and answer may be good enough for the pirated edition, but it is not after the fashion of the legitimate drama to have its sequences thus obliterated, or its important

episodes telescoped into one another like railway carriages in a collision.

The Fifth Act of the Quarto, then, is a cento of scraps and fragments stolen from Shakespeare's play, and Q1 is not an original but a copy, and a copy of the most mechanical and slavish sort, for it copies wherever it can, and would have copied more if it could. It may be credited, moreover, with a certain degree of mechanical success. For although so very much of the true text has been misplaced and mangled, the writer has picked out 40 test words, taken at irregular intervals from the last 200 lines of the Quarto, and he has found that these words follow one another in the identical order in which they stand in the longer version. This is a proof of the radical connection between the two texts in spite of so great a difference superficially. Shakespeare's work in the writing of *Hamlet* is a fixed quantity, and, in following his words, the Quarto meets, as we have said, with a certain degree of mechanical success. It is for ever on his trail, and sometimes contrives to walk in his very steps. But it is one thing for Shakespeare to have gone before, and another for the Quarto to try to follow. The interval is great, in whatever way we may think of measuring it.

If such a mechanical method of literary investigation as has been recommended, and is actually employed in this discussion, should need an apology, may not this be an excellent excuse for it, that it is the only method which seems likely to yield any assured and satisfactory results? And, indeed, it is hard to see how it can fail, if only the comparison between the two texts be sufficiently exact at all points, and be carried right through the related texts from beginning to end. What can weaken the force of evidence obtained by such a method, and what evidence could be substituted for it if we lost confidence in this? What other evidence have we a right to seek for, till we have exhausted the direct evidence proper to the case? Where this method is likely to fail is not where it is carried to an extreme, for that is hardly possible, but where it is employed in a perfunctory and superficial fashion to reach results that are the fruit of a crude and imperfect generalisation. By way of illustration, let us return to the view of the Quarto taken by the editors of the *Clarendon Press* edition, and try to understand if we can how their opinion has been formed. In the preface to their edition of *Hamlet*, this is what

we find them saying:—"After a careful examination of Q1, and a comparison of the play as there exhibited with its later form, we have arrived at a conclusion, which, inasmuch as it is conjectural and based to a large extent on subjective considerations, we state with much diffidence." But what does this statement mean, we are compelled to ask. How can careful examination and comparison, which is a *sine qua non* of all textual criticism, lead straight to a conclusion based on subjective considerations? How, with such an excellent start and making straight for the goal by way of exact investigation of the texts, have the editors been shunted on to other lines, and carried into the territory of conjecture? The matter becomes the more perplexing because, while they neglect to tell us what the subjective considerations may be on which they have based their conclusions, they are at pains to give us some idea of the nature of that examination and comparison of the texts which in their case proved so barren of results as to leave them at the mercy of conjecture. And it must be said that they do not seem to have gone very far in their examination of the texts in question, probably from sheer want of time to deal satisfactorily with the mass of literary material before them, and a conviction of the hopelessness of forming anything like a scientific generalisation from the results of a partial comparison. But the upshot has been most unfortunate in the history of criticism; for the not unnatural diffidence of the editors in pronouncing their verdict on the Quarto is in marked contrast to the almost universal homage with which this verdict has been received. And the result is the more to be deprecated if it has for any length of time discouraged attempts at further independent inquiry, for, as we have already said, the editors themselves, in their comparison of the Quarto with the current play, have not carried their investigations very far. In fact they have contented themselves with pointing out where Shakespeare's workmanship predominates in the Quarto, and where, on the other hand, it diminishes or altogether disappears. And even in this very general analysis they do not always give a correct estimate of the facts of the case, as for instance when they say of the Fourth Act of the Quarto that in language it has very little in common with the present form of the play; whereas it contains, not to notice minor reminiscences of Shakespeare's work, reports of Hamlet's farewell interview with the King, of the two appearances of the mad Ophelia, and of the

death of Ophelia—all of which it is difficult to read without being convinced of their practical identity with what we find in the current play. Let any student take as a sample the lines in which the Queen narrates the drowning of Ophelia, and say whether there is in them much or little to remind us of the language of Shakespeare's *Hamlet*. The passage referred to contains the lines,

Sitting upon a willow by a brooke,
The envious sprig broke, into the brooke she fell.

and ends with,

Till that her clothes, being heavy with their drinke
Dragg'd the sweete wretch to death.

But what we miss in the *Clarendon Press* edition is not merely a thorough acquaintance with the texts in detail, but also any satisfactory recognition of the larger and more significant features of this literary problem. We are told, for example, that the action and catastrophe of the Quarto are almost identical with those of Shakespeare, a fact which in itself demands an explanation. But we are not told that the dramatic episodes and dialogues of the Quarto are also practically the same, the episodes occurring in the well known familiar sequence, and each of the speakers in turn trying to say just what is said more fully in the perfect copy. Nor are we told that the part of Hamlet is fully worked out in the Quarto, so that his relations to each of the *dramatis personæ* are just what they are in the perfect play. The pirated edition, then, is substantially the same in contents and in plan as Shakespeare's *Hamlet*. Nor is this all. For portions of Shakespeare's finished verse are to be found everywhere in the Quarto, sometimes in large sections, sometimes in small patches, sometimes only in lines or fragments of lines, but always highly finished in versification and style, and as highly finished in the last Act as in the first Act of the Quarto. The familiar words and phrases greet us on every page. Now what does all this mean? It means, for one thing, that if Shakespeare's perfect play owes anything to the Quarto, it owes practically everything—to such an extent that if it borrowed at all from the Quarto, it borrowed in such a way as to leave nothing behind of the slightest value, whether we think of poetic phrasing or dramatic detail. We are thus shut up to the alternatives that Shakespeare borrowed everything from the Quarto, or the Quarto stole everything from him, for from these alternatives

there is no escape. And in making our choice we are guided by the fact that the peculiar features of the Quarto are never those of a first rough draft suggesting the possibility of improvement in plan or detail, but those which suggest that it is a copy of an original play in all respects superior to itself. It is a corrupt, degraded version of Shakespeare's *Hamlet*.

That the text from which the Quarto borrows was indeed a highly finished text seems indicated by two subordinate lines of evidence to which we may now refer. For how is it—to speak of the first line of evidence—that we discover in the Quarto accurate reports, perfect in phraseology and versification, of speeches made by very secondary characters like Marcellus, Voltimand, or Lucianus in the play-scene? Does this fact hint at the poet's real method in dramatic composition? Did Shakespeare compose the tragedy in irregular sections, and amuse himself by here and there touching up to the highest dramatic standard a few disconnected speeches wholly trivial in value as compared with the rest? Or again, to advert to the second line of evidence, let us ask why it is that in reading the Quarto we so often find that, while the report of a speech or episode may be bungled at the beginning and botched throughout, it so frequently contrives to reproduce Shakespeare's familiar conclusion, or something manifestly faked to resemble his concluding lines as closely as possible? Why, to take a definite example of this significant feature of the pirated copy, is it able to quote only the last words of the final interview between Hamlet and Horatio; or why, to take another example, is it able to quote so much from the last part of the dialogue in the play-scene when it has lost so completely the lines at the beginning of that scene? Is it because memory in these, as in so many other parts of the play, made a more desperate and successful effort to record the end of passages of which it had failed to record the beginning; or is this also to be regarded as an eccentricity of Shakespeare's method that with him dramatic composition should have begun at the wrong end, his genius thus making progress after a fashion so unique that we are reminded of Hamlet's recipe for growing young, to walk like a crab backwards? We may add here, what has been alluded to before, that the Quarto everywhere shows itself familiar with Shakespeare's finest dramatic touches, and with the finished phraseology of his noblest verse. It is not retracing the lines of a roughly sketched drama or trying to copy a text less highly

finished than the text we know and admire. The number of classic phrases common to the Quarto and to the longer version is in full proportion to the length of the texts. "Frailty thy name is woman: Caviare to the general: Sweets to the sweet: More germane to the matter"—these are all in the Quarto, and a hundred more.

The production and publication of the First Quarto of *Hamlet*, then, should probably be regarded as a literary feat, in connection with which we are called upon to recognise, if also to reprobate, the enterprise and audacity of a bookseller's hack, who gave himself to the task of reproducing Shakespeare's tragedy with such material as he had at his command and with such acquirements as account for the measure of his success and the greater measure of his failure. It is this predominant and personal factor in the production of the Quarto that gives us the explanation of its most characteristic features, and it is the neglect of this important factor that has led to so much confusion and misapprehension both in earlier and later criticisms of this fraudulent copy of the play. And for one thing, time and labour have been wasted in discussing how far the blunders of short-hand reporters or the imperfections of manuscript copies may have been responsible for the peculiarities and eccentricities of the Quarto, without first giving due consideration to the fact that these may be largely, perhaps wholly explained, if we choose to think of Q1 as an effort of memory, which has succeeded in recording much of Shakespeare's masterpiece, but which was almost certain to entail the omission of important passages, the transposition of some of the scenes, and the disfigurement and degradation even of those portions of the tragedy that were most perfect in the memory of the anonymous editor. For our part, we do not shrink from saying that we firmly believe Q1 to be a most interesting illustration of what was once accomplished by a sheer effort of memory in reproducing one of Shakespeare's plays; and that this view of the matter will put us right and keep us right in any comparison that may be instituted between the text of the Quarto and that of later editions of *Hamlet*. The hypothesis is easy to work and may be applied to almost any passage with satisfactory results. It will soon become a habit with the student to say, "Here, the editor's memory has made him almost word perfect in recording Shakespeare's lines; or here, on the contrary, his memory has almost or altogether

failed." The hypothesis, we repeat, is almost always applicable ; for in the best recorded passages we come upon what are plainly slips of memory, while even in the worst we can almost invariably detect some fragment of the current text that memory has not quite let go. Whatever is Shakespeare's, then, we underline in our copy of the Quarto by comparing it with the current text, and then we can set ourselves to discern the motive and inspiration of all that is not his. The motive is not far to seek, for we know how often the editor must be "gravelled for lack of matter," and that whenever he is at a loss for the true text he must make up a text to serve in the exigencies of an imperfect memory. He must supply a word, or half a line, or a whole line, or ten lines, whenever necessity demands. What can he do when memory fails, but fabricate material of his own to fill up the gaps it has left, and string together the ragged disconnected scenes? We soon become used to his tricks and familiar with his style ; and so forewarned we are not likely to make the mistake of some of the critics, who, whenever they discover a couplet that seems to them of some original merit, are tempted to hail it as the early work of Shakespeare—poetic material he used at first, but which was rejected or amended by him in his revised edition. We soon get to know the tricks of a faking-shop, and a garbled line of Shakespeare along with a line of Quarto jargon does not impose upon us, especially when we note that the whole passage in which the couplet occurs is grossly corrupt. Such lines as

Him have I lost, I must of force forgoe,
These but the ornaments and sutes of woe.

or,

My wordes fly up, my sinnes remain below,
No King on earth is safe, if God's his foe,

may have some interest for us, but no Shakespearean charm. The charm is fled, for we know that the patching-editor has faked the first line of the first of these couplets and the second line of the last. What he can do at any time in this direction might be illustrated by many examples. Let the following couplet suffice ;

Come Sir, I'll provide for you a *grave*,
Who was in life a foolish prating knave,

where he has preserved Shakespeare's rhyme at the close of a scene that he has wholly marred both in sense and in form ; but

he has preserved the rhyme only by changing an adjective into a noun and giving to Hamlet some concern for the decent interment of Polonius, a matter that has not the smallest interest for the Prince in the poet's conception of the incident.

This prevalence of fabricated material it is that makes it somewhat dangerous, whether for German or English scholars, to find parallels in the Quarto to passages in Kyd's *Spanish Tragedy* or in any of Kyd's works. There is, we believe, one notable exception; and the editor once *does* quote or misquote Kyd in a passage so corrupt that it does not matter what sort of literary padding he uses. This passage has been accepted in all seriousness by many scholars as if it implied a first intention on Shakespeare's part to place Hamlet on easier terms with his mother than in the later version of the play. But when the Queen in Q1 is made to say,

Hamlet, *I vow* by that majesty,
That knowes our thoughts and lookes into our hearts, . . .
I will conceale, consent, and doe my best,
What stratagem so e're thou shalt devise,

she uses words that the poet never put into her lips. In Shakespeare's play Hamlet can never stoop to ask the Queen for help, and she knows better than to offer it. But the Quarto takes the keen edge off the extreme loneliness and morbid reticence of the Prince, and in this passage crowns the mischief it has done by this tangled quotation, in which the words of Hieronimo to Bellimperia are jumbled up with her reply to him and his response to her again. It is a feat worthy of Cerberus, who could "pronounce a leash of languages at once," but we can find nothing here of Shakespeare's early work. The danger of this predilection for the discovery of parallel passages between the Quarto on the one hand and earlier Elizabethan verse on the other may find further illustration in the mistake of the German scholar, Sarrazin, who puts forward the following passage as a reminiscence of Shakespeare's *Henry V.*, as if the poet had unconsciously been betrayed into quoting from his own favourite drama of English history:

Well sonne Hamlet, we in care of you: but specially
In tender preservation of your health.

.

The winde sits faire, you shall aboorde to-night.

Certainly we do read in Henry V., with a curious reversal of the order of these lines,

Now sits the wind fair, and we will aboard,

Though Cambridge, Scroop, and Grey, in their dear care
 And tender preservation of our person ;

nor can it be denied that the outward similarity between these passages might tempt us to yield assent to their literary relationship. And then these lines in the Quarto, which of course are not to be found in the perfect copy, might fairly be adduced as testifying to some real connection of Shakespeare with the early edition. But what if these lines, supposed to be reminiscent of Henry V., should be embedded in a passage which as a whole is a botched transcript from the editor's memory of the corresponding passage in the perfect copy? In our own copy of Q1, it is marked as a conglomerate passage, containing ten words at various intervals which are identical with words in Shakespeare's original lines. Further, these lines occur in a speech of Claudius, which in the Quarto resists grammatical analysis, and sets at defiance the rules of prosody, so that we are in doubt whether the first line of the speech should count as 13 syllables or as 23. And therefore the question remains to be answered whether in the lines just quoted we have a genuine reminiscence of Henry V., or merely another sample of Quarto jargon. To those who are familiar with the editor's vocabulary the word *tender* in itself is enough to bring suspicion on the lines containing it. In the original passage Shakespeare uses *tender* as a verb :

Hamlet, this deed for thine especial safety,
 Which we do tender, etc.,

but the Quarto after its fashion utilises it as an adjective, and talks of "tender preservation" of Hamlet's health. And it must be noted that the editor has an unfortunate liking for the word. It first caught his ear when he made Ophelia say to Polonius,

He hath made many tenders of his love to me.

She should have said not "love" but *affection*, giving Polonius the chance to reply

Affection pooh ! you speak like a green girl ;

instead of which he fires off in the wrong place,

Tenders, I, I, tenders you may call them.

'The last is a mongrel line moulded on Shakespeare's

Ay, Fashion you may call it,

and in the Quarto it leads up to the admonition,

In briefe, be more scanter of your maiden presence,

Or tendering thus, you'l tender mee a foole,

where of course Polonius should have said *running it thus*, etc. But having had this amount of practice in the use of the word, it need not surprise us if the patching-editor should give it a little gentle exercise throughout the rest of the play. Thus, in addition to the passage with which we are concerned, he trots it out in line 701, where we find the King saying,

Therefore we doe desire, even as you tender

Our care to him, and our great love to you ;

and again in line 2012, where Claudius once more uses it to say,

Even as they tender us, and love their countrie.

We may add that the phrase "the wind sits" and the word "aboard" are among the patcher's stock in trade. He employs them freely as having a pleasant nautical flavour about them ; and so, all things considered, we must refuse to look upon these lines as either preserving a genuine Shakespearean phrase, or even the tender recollection of one. They are not reminiscent of Henry V., but redolent of the faking-laboratory from which the Quarto was foisted on the literary world.

One of the most piquant and satisfactory proofs that the Quarto as a whole implies a real effort of memory on the part of the editor is that, in recording occasional phrases, he blunders in such a foolish fashion that it is perfectly evident they must be taken not from any manuscript lying before him but from his own imperfect recollection of Shakespeare's lines. Again and again, he uses phrases at the wrong moment, and in a context to which they do not belong, and the result is sometimes sufficiently absurd. We must find room for one or two examples. Laertes in conversation with Claudius makes use of the very same phrase he afterwards employs in his sophistical speech to Hamlet in the last scene of the play. His words when he commits the blunder in the text of the Quarto are,

To his good friends, thus wide I'll ope mine arms,

And locke them in my hart, but to his foes

I will no reconciliation but by blood.

What makes the mistake the more ridiculous is that in the true text these three lines do really end in *blood*, but the blood is not that of Laertes' enemies, it is *his own*, with which, "like the kind life-rendering pelican," he offers to repast his father's friends. The Quarto remembers there should be blood, but forgets whose blood it should have been. To this stupid misplacing of phrases, even Hamlet himself is made to contribute. Twice, for instance, in the Quarto, he uses in speaking to his mother, words that properly belong to the Ghost, at one time saying to her,

O, mother, if ever you did my deare father love,

and at another time

Whose heart went hand in hand even with that vow
He made to you in marriage.

These blunders of Hamlet carry with them no very serious consequence, except that, taken together with other mistakes, they cast suspicion on the whole passage where they occur. But it is a much more serious matter when, at the very beginning of the play, immediately after the Ghost has left him, and when horror at the dreadful story he has heard is succeeded by bitter anger against the King and Queen, his two heart-wrung ejaculations, the first referring to his mother and the second to Claudius, are run together and made to apply to Claudius alone. This is one of the earliest indications that the Quarto cannot sustain itself at Shakespeare's tragic level. It resembles *Fratricide Punished*, and harmonises with all superficial criticism of the play in this particular that it cannot appreciate a hero whose anger at his mother's offence against his father's honour is a deeper and more engrossing passion than rage at his father's murderer. And the Quarto enters on a blundering neglect of this distinction, when it refuses to record Hamlet's first ejaculation,

O most pernicious woman,

which should have been kept separate, and should have been followed by

O villain, villain, smiling damned villain.

These two ejaculations, so significantly arranged by the poet, the Quarto merges in the lines,

Yes, yes, by heaven, a damn'd pernicious villaine,
Murderous, bawdy, smiling damned villaine—

lines which are both jumbled and faked, for “murderous” and “bawdy” are sneaked from Hamlet’s first remorseful soliloquy (line 1125) to garnish the couplet we have just been quoting. It is of course a blunder in the same direction whenever in the Quarto Hamlet is made to address the King in any words that do not insult him with most deadly sting, and especially whenever he is made to call him *father*. For, to make use of a Hibernicism, he should never even in sarcasm call him father till he calls him *moth r* in that interview where Hamlet’s hatred of Claudius, though not directly expressed in words, infects the murderer like subtle poison, and burns “like the hectic” in his veins. Who would venture to say that blunders such as these we have pointed out are characteristic of the first hasty draft of a tragedy—commonplace mistakes to be corrected in the revised edition? They are nothing of the sort. When Hamlet at the centre of the play is twice made to use the words of the Ghost in addressing his mother, it is not a blunder of the poet indicating the need of revision. It is one of the pranks of the literary imp who has bedevilled Shakespeare’s masterpiece, and it is always hard to say what prank he will play next.

The First Quarto may not unfitly be called a homogeneous conglomerate; for what we discover it to be at the very beginning, that we find it continues to be to the very end. The first complete line is,

O you come most carefully upon your watch;

and the last two lines are,

Take up the *bodie*, such a sight as this
Becomes the *fieldes*, but here doth much amisse;

and even in these few lines we can find divergences from the current text that can only be explained by the fact that the editor had no authoritative text before him, so that his mistakes in these very lines may be taken as typical of the mistakes he is likely to make throughout, whether we are looking for errors in sense or in versification. And at this point in the discussion, we are anxious to direct some special attention to the Quarto’s blunders in *versification*; for though it may be difficult to deal with its blunders in prosody apart from its blunders in sense, yet the attempt should be made, as it is in this feature of the text that we shall find the clearest and most abundant evidence of our thesis that the Quarto is an effort of memory, and that the memory at work

is that of a single individual whom we have dubbed "the patching-editor" of the pirated edition. From this our present point of view, then, the editor's task was to reproduce the blank verse of Shakespeare's *Hamlet*, and his success is to be measured by the number of lines he has been able to print in their perfect form. And surely there is little room in such an enquiry for mystery or mistake. We know what Shakespeare wrote. We have Shakespeare's lines before us, if the editor of the Quarto had not. And therefore it will not be a difficult matter, in a study of the 2000 lines which in the mutilated copy stand for the 4000 lines of the current play, to decide whether the mistakes in versification are to be credited to one individual or not. For the mistakes we find in Q1 are mistakes that indicate a total ignorance of the first principles of prosody. Its prose passages are printed as if they were verse, and it does not shrink from such an atrocity as this :

The best actors in Christendome,
 Either for Comedy, Tragedy, Historie, Pastorall,
 Pastorall, Historicall, Historicall, Comicall,
 Comicall historicall, Pastorall, Tragedy historicall :
Seneca cannot be too heavy, nor *Plato* too light :
 For the law hath writ those are the onely men.

But alongside of such a passage as this, we could print long passages from the Quarto where Shakespeare's blank verse is rendered with almost perfect accuracy, and if our view of the Quarto is correct, it must embrace and explain these two phenomena—its occasional and almost complete success on the one hand and its liability to make the most atrocious mistakes on the other. Can these two facts be reconciled on any other theory than this, that the editor was utterly ignorant of the rules of prosody, but that he had an excellent memory which kept him right whenever he was able or willing to rely upon it?

We have seen, then, that where memory serves him, the editor of the Quarto may be expected to reproduce Shakespeare's lines with wonderful accuracy, but it should be noted, that even where he is most accurate, he is liable to sudden lapses that betray a radical ignorance of the simplest rules of prosody, and show that he had no natural gift to compensate for his ignorance. He cannot be trusted for any great length of time to divide his lines correctly even when he is word perfect in a particular part of his text. And when he is thrown out of his reckoning, as he always

is where Shakespeare divides a line between two speakers, or where he begins or ends a speech with part of a line, the editor may be expected to blunder on for four or five lines before he can recover the rhythm of the passage again. It matters little to him at any point, if he should have three or four extra syllables in his lines, and as little if they should be short to the same extent. The rawness and recklessness of his versification is most pronounced in passages where he is striving hard to recall and reproduce something both of the matter and the form of Shakespeare's poetry; but it is painfully perceptible even in passages where, as in the conversation between Horatio and the Queen, he has to invent the matter for himself, and is therefore free to put it into the best form of which he is capable. In the writing of rhyme he has more facility, and indeed is often betrayed into rhyme where its use is quite superfluous. In reading the Quarto, then, wherever we find that Shakespeare's verse is marred by a faulty division of the lines, wherever they are curtailed or stupidly prolonged, we can detect the blunder and correct it by referring to the perfect copy. And in the same way we can separate out those passages in the Quarto where memory has enabled the editor to record the greatest number of lines correctly, and those, on the other hand, where his failure is most conspicuous and complete. If the patching-editor should have been, as we suspect he was, one of the players in Shakespeare's company, it is not unlikely that he may have had allocated to himself two or three of the subordinate parts of the play, and this may account for the curious fact that the passages most fully and correctly reported are speeches delivered by Marcellus, Voltimand, and Lucianus. It should be noted, on the other hand, that his most woeful failures are in his attempts to record the soliloquies of Hamlet, though we have every reason to believe that these were all most carefully finished by Shakespeare before the Quarto attempted to reproduce them. In Hamlet's first soliloquy, "O that this too," etc., only five lines are started correctly, and only one line is complete (the very last). In the "To be soliloquy," eight of Shakespeare's lines begin correctly, and only one is complete (the second last). In Hamlet's first remorseful soliloquy, eight lines are begun correctly and one is complete (again the very last).

These Quarto soliloquies have often been regarded as if they embodied a first "essay" on Shakespeare's part, and quite recently

an attempt was made in an article in the *Westminster* on "The lost *Hamlet* of Kyd," by a re-arrangement of the lines to make some kind of sense out of the "To be soliloquy," as recorded in the Quarto, in order that it might be accepted as the early work of the poet. But why should the writer in the *Westminster* have exercised his ingenuity on that soliloquy alone; why not endeavour to give us some idea of the original shape of the others as well? The truth of the matter is, that it is impossible to account for any of these soliloquies in the Quarto on any other theory than that which will explain the Quarto as a whole, and it is also true that the study of any one soliloquy may in itself give us a clue to the nature of the whole text of which it is a part. For it is not hard to see that, in his report of Hamlet's speeches, the editor is trying hard to set down every word he can remember, in the best order he can assign to it. And they certainly do not read as if in them the Quarto had preserved to us "the first rough touches of the great master's hand." They are nothing but the veritable *debris* of the passages we are familiar with, turned into a rubbish heap in the memory of an audacious forger. By comparison with the true copy, we may succeed in reconstructing a few complete lines of Shakespeare's original verse—in the case of each of these soliloquies—out of the scattered phrases to be found in the Quarto. But what is of more significance in support of our hypothesis is the fact that *by diligent search* we can discover the first words of many more of Shakespeare's lines. Thus, taking Hamlet's speeches in the same order as above, we can discover in his first soliloquy the opening words of twenty lines, in the "To be soliloquy" of twelve, and in the first remorseful soliloquy the beginnings of fourteen of Shakespeare's original lines of blank verse. And this, of course, we could never have done, had we not had the perfect copy to compare with the Quarto. Are we not at liberty to conclude that the perfect copy must have been extant before the Quarto could have exercised the vile privilege of mangling and mutilating its noblest passages?

What we discover, then, throughout the Quarto is that the editor has no technical knowledge of blank verse; that trusting to his memory he is able to record many consecutive lines with perfect accuracy; but that he is liable to blunder at some point or other, and that the failure may occur in his most perfectly reported passages. And we may say now that we cannot reconcile these phenomena with the view that he had access to any manu-

script of the play. His version, as a whole, bears witness to the fact that it passed into print through the medium of his own imperfect memory; and indeed it bears the impress of his own moral and mental idiosyncrasies, as well as of his own literary disabilities. To one of his literary weaknesses we wish now to refer, because it shows that an untrained and vulgar mind is at work on this copy of Shakespeare's play. We are thinking of his careless and continual repetition of words and phrases, in itself a marked feature of the slipshod composition which is so prevalent in the Quarto as to afford a strong proof that one mind is responsible for the version as a whole. And this vulgar licence of repetition the editor allows himself, not only in passages of his own composition, but even when he is most familiar with Shakespeare's lines and most perfect in his reproduction of them. It follows as a matter of course, in the case of an ignorant redactor, that where Shakespeare's own repetitions are most emphatic and impressive, we cannot rely upon the editor of the Quarto to appreciate and reproduce them. For his own vulgar repetitions, however, we have not far to seek. Opening a page at random we find,

But what is your affaire in Elsenoure ?

and five lines afterwards,

But what is your affaire in Elsenoure ?

Shortly after that we read,

The morning cocke crew lowd, and in all haste
It shruncke in haste away ;

while on the next page we have,

O your loves, your loves, as mine to you ;

and again,

You have bin too prodigall of your maiden presence,

followed ten lines after by,

Be more scanter of your maiden presence.

Some forty of these repetitions may be counted in Act I., and upwards of two hundred in the Quarto as a whole; and of this trick of repetition we are entitled to ask if it is one that could creep into any record of Shakespeare's lines except as we think of them as passing through the memory of a careless transcriber, who had no manuscript to save him from indulging his verbosity. It is not a fault that naturally belongs either to the copying of a manuscript

or the taking of shorthand notes, but it does belong to the Quarto. It may be noted further, to complete this line of investigation, that this careless repetition on the part of the editor is often combined with his indifference to rhythm ; witness the line,

O my father, my father, methinks I see my father ;

while we find that at line 494 the words "brief let me be" are put into the lips of the Ghost for a first time only to pad out a line in a disorderly passage, and allow the editor to return again to the order of Shakespeare's blank verse, which for six or seven lines he has completely lost.

But perhaps we may be able now to give a more convincing demonstration of the fact that Q1 is to be ascribed to the audacity and dishonesty of a single individual. We have taken him to be an actor of Shakespeare's company ; for who besides could be thought of as having the opportunity to gain so great a familiarity with the play without the aid of a manuscript of any sort ? He is a man sufficiently ignorant to allow him to write all the rubbish that takes the place of the genuine text when memory fails him. He can perpetrate all the atrocities in grammar, versification, phraseology, taste and sense that crowd his patch-work from first to last. As we have seen, he is ignorant of blank verse, and cannot even record it correctly. Yet his familiarity with Shakespeare's and other plays has been a kind of literary training. Nay, the rogue has caught the trick of Shakespeare's style, and on occasion he can mimic some of the poet's mannerisms—his bold antitheses, his twin substantives or epithets, his use of the abstract for the concrete, his grand or grandiose figures of speech. He can write such lines as these,

The Jewell that adorn'd his feature most
Is filcht and stolne away.

The Courtier, Scholler, Souldier, all in him
All dasht and splintered thence.

I'll have a potion that shall ready stand
Shall be his period and our happinesse.

a while I'll strive
To bury grief within a tombe of wrath.

For your intent going to Wittenberg
Wee hold it most unmeet and inconvenient,
Being the Joy and halfe heart of your mother.

a face like Vulcan,
A looke fit for a murder and a rape,
A dull dead hanging looke, and a hell-bred eie
To affright children and amaze the world.

In the writing of rhymed verse he seems much more at home, and may possibly have had some considerable practice in rhyming. At all events he writes with much more ease, simplicity, and regularity in rhyme than in blank verse. One of his best efforts is in the short passage,

O Time, how swiftly runnes our joyes away?
Content on earth was never certaine bred,
To-day we laugh and live, to-morrow dead.

His few lines at the beginning of the play-scene are of the same simple type as those we have just quoted, but they improperly displace the most turgid lines to be found in Shakespeare's *Hamlet*, lines containing allusions to "Phoebus' cart," "Neptune's salt wash," and "Tellus' orb'd ground," that were probably beyond the intelligence of the editor of the Quarto, or had easily escaped his memory. In his attempts to imitate Shakespeare's blank verse, however, we feel as if he were riding for a painful fall and ever in danger of coming to the ground. At his best in lofty tragedy he reminds us of serving-men and maids who mimic the talk of dukes and duchesses with vulgar exaggeration. At his worst his lines are far beneath contempt, for apparently he is writing against time, and is usually content to fill up the gaps in his garbled version with prosaic rubbish composed of weak and colourless monosyllables and dissyllables. He is paid to reproduce all he can of Shakespeare's play, and he rarely, if ever, ventures on an original thought or picturesque detail. The nearest approach to a novel dramatic detail, such as might be thought worthy of a place in a tragedy of Shakespeare, is probably to be found in the remark of the King bidding Rosencrantz and Guildenstern spare no expense in furthering the production of the play within the play—

Our coffers shall be open.

This poverty of picturesque dramatic detail on the one hand, or of what might have been hailed as Shakespearean phraseology on the other, would be truly inexplicable in what is supposed to be an initial sketch of a Shakespearean drama. A first sketch of Shakespeare in its literary luxuriance might have resembled a garden

in the tropics; but if we search the Quarto for anything Shakespeare may be supposed to have left behind, when he pruned and trimmed it into the true and perfect copy, it is discovered to be as barren of fruit and flower as a stretch of sand in the Sahara.

The patching editor's work, then, is work of the study, whether his faking laboratory was in Grub Street or elsewhere. In one long section of the Quarto, moreover, we seem to be able to detect him at work in his hasty efforts to bind together and give some appearance of continuity and sense to the literary medley for which he is responsible. By his harping on one idea, as well as by the poverty and monotony of his vocabulary, it is as easy for us to track him at his work as to follow a mole by the mischief he has done. The following lines extend over a large part of the Quarto, and indeed any conclusion to be drawn from them may rightly be applied to the work as a whole :—

1. 703—King to Rosencrantz and Guildenstern,
That you will labour but to wring from him
The cause and *ground* of his distemperance.
Doe this the King of Denmarke shall be thankful.
1. 711—Guildenstern in reply,
To know the grieve troubles the Prince your sonne
We will endeavour all the best we may.
1. 902—King,
No, no, that's not the cause,
Some deeper thing it is that troubles him.
1. 953—Rosencrantz to Hamlet,
if we might
Know the cause and *ground* of your discontent.
1. 1138—King,
Lords can you by no means finde
The cause of our sonne Hamlet's lunacie?
1. 1142—Guildenstern in reply,
My lord, we have done all the best we could
To wring from him the cause of all his grieve.
1. 1163—Corambis (Polonius),
We cannot yet find out the very *ground*
Of his distemperance.
1. 1170—Corambis to the Queen,
There question you the cause of all his grieve.

- l. 1176—Corambis to the King,
Myself will be that happy messenger
Who hopes his griefe will be reveal'd to her.
- l. 1359—Rosencrantz to Hamlet,
Let us again intreate
To know the *ground* and cause of your distemperature.
- l. 1363—Rosencrantz to Hamlet,
But my good Lord, shall I intreate thus much?
- l. 1153—The King,
And we unto yourselves will still be thankfull.
- l. 1154—Rosencrantz and Guildenstern,
In all wee can, be sure you shall command.
- l. 1155—The Queen,
Thanks gentlemen, and what the Queene of Denmarke
May pleasure you, be sure you shall not want.

In these lines, then, it must surely be acknowledged that there is but one hand to be seen, one voice to be heard. It is the voice of the patching-editor of the Quarto, venturing gallantly into high dramatic dialogue, and speaking for five of his leading *dramatis personæ* with as little variety in his accents as we can detect in the bleating of a sheep. The words of the Queen we have purposely placed at the end of the series because we wish to point out that they are unblushingly faked from line 625 ;

And what so poore a man as Hamlet may
To pleasure you, God willing shall not want.

It is all a pitiful exhibition of uninspired and mercenary fabrication ; but what we want to make very emphatic is the fact that he who is responsible for this travesty of dramatic dialogue is also responsible for a certain passage to be found at the very beginning of the version,

and this (I take it) is the
Chiefe head and *ground* of this our watch ;

and also for the following passage at the very end of the work, where the use of the word *ground* is equivalent to the editor's sign-manual, and a very satisfactory confession of his share in a great literary fraud,

Content yourselves, I'll show to all the *ground*,
The first beginning of this Tragedy.

But passing now to another feature of the Quarto of very considerable interest, let it be remembered that if, on any grounds, priority of date has been claimed for the edition, it has been in connection with the order of various important scenes as compared with the order of these scenes in the fuller editions of the tragedy. And what we here intend to show is that the order in the Quarto is not the original order of Shakespeare, but a stupid and blundering disorder, on a level with the many minor displacements with which every student is quite familiar. Let us recall, then, those longer scenes, the order of which is now in question. We easily remember that in the current text Polonius is the first to intrude upon the privacy of Hamlet, and to provoke him to speech after a silence maintained for two long months of his brief career. Next to Polonius come Rosencrantz and Guildenstern, who are commissioned to interview the Prince, and who try to rouse him out of his gloomy seclusion by announcing the arrival of the players. The advent of the players suggests to Hamlet a means of testing the guilt of the King by the performance of "the murder of Gonzago;" and it is after arranging for this piece that in his first remorseful soliloquy, "O what a rogue and peasant slave am I," he gives us the first impression we gain of his real mental condition, and of his attitude towards his revenge. Meanwhile Rosencrantz and Guildenstern have reported their failure to discover the secret of the Prince, have told of his preparations for the play within the play, and of his request that the King and Queen should be present. To this request their Majesties give an easy consent; but then and there, at the suggestion of Polonius, it is resolved that some time before the play Ophelia shall try to lure Hamlet into a confession of the true cause of his strange demeanour. The Prince is therefore sent for, on what pretext we are not told. Enticed to the spot, he approaches lost in thought and speaks the "To be soliloquy." This is followed by the passionate interview with Ophelia, witnessed by the King and Polonius from behind the arras. On leaving Ophelia, Hamlet perfects his preparations for the play, which is almost immediately performed, with what results we know. In the Quarto, however, the order of these scenes is quite different. The "To be soliloquy" is spoken when Hamlet first appears upon the stage after months of solitude and silence. Ophelia, at this his very first appearance, is sent out to confront him on the spur of the moment; and it is only after she has failed

that Polonius tries what he can make of the Prince, while Rosencrantz and Guildenstern have to be content with a third place in the attempt to gain his confidence. Towards the close of their interview, the players arrive, and events follow in the familiar sequence: only, in the Quarto, neither the "To be soliloquy" nor the meeting with Ophelia intervenes to delay the acting of "the murder of Gonzago."

Much might be urged on aesthetic grounds to disparage and cast suspicion on the order of these scenes in the Quarto, but we shall be content to show that evidence of confusion and disorder is to be found in the text of the Quarto itself—evidence varied and abundant, simple, complex, and cumulative. How could it be otherwise, on the supposition we hope to turn into a certainty, that the Quarto is a vulgar travesty of Shakespeare's play? The plot of any of his great tragedies is like a complicated tapestry, of which, in the case of Q1, it is as if the pattern had been cut across by those who could not remember what it was, and who must join it together again as best they may. But if they go wrong by a single inch, the piecing together will be a grotesque failure all along the line, the more intricate the pattern the more signal the failure. We therefore need not be surprised to discover that the Quarto fails to effect more than a mechanical joining together of the various scenes it has displaced, showing an utter disregard for the plan and spirit of the drama. In so doing, however, it earns our thanks for an unconscious service rendered, because by its rude blundering it heightens our admiration of the consistency and precision of Shakespeare's workmanship, never so fully appreciated as when we discover that one of his noblest plays, like Caesar's body, has been marred by traitors.

The wholesale confusion and disorder, we must now deal with, begins with a statement made by Ophelia when she says of Hamlet,

Hee found mee walking in the gallery all alone.

Such a statement at once transfers the appropriate scene of a trance of passion, so intense that the poet conceals it from every eye, away from the privacy of Ophelia's chamber to a place of public resort in the palace—the gallery¹—open for exercise not only to Ophelia and Hamlet but to the courtiers in common.

¹ *Gallery* in Q1 is used for *lobby*, which is Shakespeare's word. There is a "gallery" in the *Spanish Tragedy*, but it is not a place of exercise.

But Ophelia had been ordered "to lock herself from his resort," or "to absent herself" as the Quarto puts it, and it is the boast of Polonius that she as his daughter "obediently obeyed him." What is she doing, then, in the very spot where she might have expected to encounter Hamlet? Is Ophelia again, and so soon after her father's stern rebuke, so prodigal of her maiden presence? If she had deliberately resolved to disobey, if she had planned at all risks and against all opposition to meet her lover, the gallery was the very place to find him; for hear what Polonius says in the Quarto:

The Prince's walke is here in the galery,
There let Ofelia walke until hee comes;

and so we have this strange sequence that Ophelia's disobedience not only escapes reproof, but is rewarded by her father's command that she should repeat the offence, and meet Hamlet in the gallery again. But we are not done with this preliminary muddle. We have yet to ask ourselves whether Ophelia was in the gallery after all when startled and shocked by her lover's intrusion; for if so, what does she mean by saying in the Quarto that the Prince on leaving her "found his way without his eyes," a thing he might easily have done in the gallery where every day he walked for hours; what does she mean when she says (line 685),

For out of doores he went without their helpe,
And so did leave me?

What doors are these? Are they the doors of the gallery, or are they not, in spite of the Quarto, the doors which Hamlet ordered to be shut upon Polonius that he might play the fool nowhere but in his own house?

But again, in connection with this charge of disorder brought against the Quarto, let us ask where Ophelia is supposed to be when her father reveals the secret that Hamlet has been her lover, and reads to the King and Queen the little love letter surrendered to him by his daughter. Prof. Herford in his *Harkness Prize Essay* corrects Grant White for asserting that Ophelia was not present on this occasion; and of course it is easy for anyone to point to the stage direction of the Quarto announcing the entrance of Polonius¹ (Corambis) and Ophelia. Of course, the Quarto says

¹The difference of proper names in the Quarto, as compared with the later editions, does not call for any serious attention. The suggestion may be made that Shakespeare changed Corambis into Polonius, etc., as the cheapest way to dissociate his own play from the pirated version.

Ophelia was present, but present on such an occasion she has no right to be, except through the vile blundering of the Quarto. For surely, on grounds of common sense and decency, it is a double mistake to introduce Ophelia and enforce her presence both while the ambassadors from Norway render their account of the important mission on which they had been sent, and also while her relations with Hamlet are to be discussed between her father on the one hand and the King and Queen on the other, who are to learn for the first time that the Prince and Ophelia have been lovers. True, the trio are none of them noble in character, but they have all more than an ordinary regard for appearances, and would not willingly betray themselves to one another as lost to all sense of decency and decorum. The Queen is not a woman who would show herself devoid of all consideration for the outraged modesty of a timid girl; nor is the King a fool that he should lose his grip on the management of affairs and run the risk of entangling questions of high policy with delicate family secrets; while Polonius would hardly enjoy himself so much as he expects to do, if his own daughter were within hearing of all he intends to say. Must Ophelia, then, be present when Polonius in the Quarto says,

My lord I have a daughter,
Have while shee's mine ;

or when the King asks,

But how hath she
Received his love ?

And if it should be objected that the King never asks that question in Q1, the objection has only one leg to stand upon, for the answer to the question is left sticking in the text, and Polonius is made to say in answer to a question never asked,

My Lord, what doe you thinke of me ?

But again, must Ophelia be present when the ambassadors are invited to report on their embassy to Norway? She should not have been there, and from the current text we know she was not there. For we find in the perfect copy a short passage of eight or nine lines recording a conversation, in which Polonius has a share but in the course of which, by the King's command, he leaves the council-chamber to usher in the ambassadors, giving the guilty King and Queen an opportunity to speak to one another of Hamlet's condition and the probable cause of it *in terms never*

meant for any ears but their own. This most significant passage has been dropped from the text of the Quarto, and the ugly gap that is left is filled in with four words of Quarto jargon, the only response that is made by anyone at all to the twofold announcement of Polonius that the ambassadors have arrived and that he has found the very depth of Hamlet's lunacy. The King is dumb and helpless when this double announcement is made, but the Queen is allowed to interject the words, "God graunt he hath"—a prayer that serves her three times in the Quarto—and that hackneyed prayer must serve to bridge this most peculiar rift in the drama. But now, turning again to the authorised text, we note that the King's last words to the Queen in the private conversation excised from the Quarto are, "Well we shall sift him." He is speaking of Hamlet, of course, but he is interrupted by the entrance of the ambassadors, and his salutation to them, "Welcome my good friends," completes the line of blank verse before, in the next line, he gives them permission to speak,

Say, Voltemand, what from our brother Norway ?

Things, then, in Shakespeare's play are in perfect order, and court ceremony is not set at defiance. No Ophelia is present when grave affairs of state are to be considered. The Queen does not thrust herself forward before her husband has had time to speak ; the ambassadors are not permitted to enter the royal presence without permission ; and the King does not say abruptly,

Now, Voltemar, what from our brother Norway,

rudely ignoring the presence of his fellow-ambassador. Has the Quarto, then, omitted the eight or nine lines that are needed to give sense and order to the proceedings, or did Shakespeare manufacture these lines out of the Queen's "God graunt he hath"? Does the question need to be asked? But if the Quarto has excised that conversation between the royal pair, in doing so it has left the rough edges that betray the excision, and is made in spite of its own misstatements to certify that Ophelia was not present when Voltemand and Cornelius were ushered into the council chamber, was not present when Hamlet's love letter was read by Polonius, and was not present on Hamlet's first appearance in the action of the drama.

But now, for the sake of argument, let us suppose that Hamlet's

entrance is really made under the conditions that prevail in the Quarto, and let the King be the first to hail his approach with the words,

See where hee comes, poring upon a booke.

If then, on this particular occasion, he comes thus upon a chance into full view of those who have just been speaking of him, should we not expect him to be received as if it were indeed a fortuitous advent? He is so received in the real play, and events follow in what seems a likely order. Polonius is naturally eager at the very first opportunity to try conclusions with the unfortunate Prince. What power on earth could have restrained him from gratifying his senile curiosity or induced him to take a second place when there was an opportunity so pat calling for the exercise of his infallible wisdom? Besides, nothing was risked if nothing was gained by what was to be on his part a mere scouting expedition. And if Rosencrantz and Guildenstern should arrive, as well they might at any moment, Polonius could easily leave the field to them and make way for their more deliberate attack. But to test the love of Hamlet for Ophelia was a delicate matter, calling for careful planning and preparation. Time and place must be considered. Hamlet must be sent for "closely" that he "as 'twere by accident might affront Ophelia," and "that green girl" must needs be schooled to play her part in such an interview. The little properties of love-tokens and prayer-book must be got ready. The King and Polonius must be concealed behind the arras before Hamlet comes in sight, and above all, things must be managed so as not to risk any untoward interruption, not to speak of detection, in the course of their "lawful espials." In Shakespeare's play, the matter is thus carefully arranged, and Ophelia's attempt to lure Hamlet into a betrayal of his secret is postponed to the very last moment, with all these details in view. In the Quarto, however, no pre-arrangement is possible; yet strange to say the signs of pre-arrangement are all here, in the blundering text as in the perfect copy. Polonius has the prayer-book ready, and Ophelia has her presents gathered together to put back into her lover's hands, while her little rhymed speech has been composed and is actually recited, though the quatrain is both mutilated and misplaced in Q1.

But to all this disorder and confusion another item must yet be added, if Hamlet's interview with Ophelia is to be placed first in the list of these encounters. It is a long interview, and in the

Quarto it is immediately followed by the skirmish with Polonius. Where, then, are we to think of Rosencrantz and Guildenstern as being engaged in searching for the Prince. They must be thought of as hunting up and down for hours in vain, so that they who were first and specially commissioned—sent off in hot haste and in advance of all the other spies—find their opportunity last of all, and have to be content with a third place in this campaign of espionage. In the current play, the King does not anticipate any difficulty, for he says to his courtiers,

Go some of you,
And bring these gentlemen where Hamlet is.

Nevertheless things are so managed or mismanaged in the Quarto that long after we know they had left the royal presence on their ignoble errand, we are made to feel doubtful whether they have started on the trail at all, for we hear Polonius say (l. 906) "Send you those Gentlemen," as if they had not been sent out before he himself appeared on the scene and indeed apart from any suggestion of his.

Is not this a sad dramatic tangle? But we are not yet aware of all the resultant confusion. Of such an enquiry as that in which Claudius and his courtiers were engaged, was not the natural order to discover, first, if Hamlet was really mad, and second, if he was mad for love of Ophelia? The Quarto reverses the natural order, and this is the source of the confusion we have already noted. But in further illustration of the confusion in the Quarto, think how much worse than merely stupid it is that Polonius, after he had seen that Hamlet recognised Ophelia as soon as he sets eyes upon her, should have taken the trouble to ask, "Now, my good lord, do you know me"? Did he think it possible that Hamlet could have forgotten him when, a moment before, he had heard the Prince call him an old fool, and demand that the doors of his own house should be shut on him as on a public nuisance? In the familiar version of the play, of course, where Polonius is the very first to accost Hamlet, it is quite natural for him to wonder that the mad Prince should be able to remember Ophelia, seeing that he had just failed egregiously to remember Polonius himself. "Still harping on my daughter," he mutters, "yet he knew *me* not at first; he said I was a fishmonger, he is far gone, far gone." Later on in the play, Polonius is again struck by the fact that Hamlet should be able to keep Ophelia in mind. "Still on my

daughter," he says, as if astonished that Hamlet's wandering wits could rest on the thought of anyone, especially after he himself had been called "old Jephthah" by the "mad young man." The Quarto, however, by placing the interview with Ophelia first, has robbed these reflections of Polonius of all their zest and humour. And it forgets that, on Hamlet's first interview with Polonius, some reference to Ophelia should have been made by the Prince, if only to justify the old man's pet theory that disappointed love is to blame for his strange condition. And so

"All this comes by love, the vemencie of love,"

is what we hear Polonius say, in a context where Hamlet has not even referred to Ophelia. In such a context, the Quarto could make no use of the phrase "still harping on my daughter;" but the phrase remained sticking in the memory of the patching-editor, and he uses it at the wrong time, inserting it where Shakespeare was content to say, "still on my daughter," not forgetting that *he* had used the word "harping" on the previous occasion. Few would credit the poet with so fine an economy in the use of words, but his workmanship in the tragedy of *Hamlet* is very careful, even if not fastidious, and we are often induced to take note of the fact by the contrasted carelessness and vulgarity of the Quarto.

In the same connection we may now refer to the awkwardness arising from the Quarto's bringing Hamlet twice on to the stage with a book in his hand; and the tragedy begins to get painfully bookish when a book is placed in Ophelia's hands also. Indeed, if on the first occasion Hamlet is to approach "poring on a book," and Ophelia is to "walke aloofe" reading on hers, there is some danger that the lovers may pass each other like ships in the night, within hail but never knowing it. There is some awkwardness also in connecting the "To be soliloquy" with any book that is supposed to be engrossing Hamlet's attention, for the soliloquy springs straight from the records of his own sad heart. But Mr Widgery, in his *Harkness Prize Essay*, not knowing how rotten a reed he is leaning upon, quotes the first line as it stands in Q1,

To be, or not to be, I there's the point,

and makes Hamlet direct his forefinger to the very passage of the book that is supposed to have given rise to his sad reflections. It is an interesting suggestion, but it should not for a moment be entertained; for "there's the point" is a mongrel phrase, born of

the two phrases—"that is the question, and there's the rub"—both of which may be found separately in the authentic text but neither of them in the Quarto.

Taking the most notorious illustration of a difference in the order of events as arranged in the Quarto, and as opposed to the order of the current text, we have tried to prove that the Quarto is not an original draft but a later and corrupt version of the tragedy. But if it cannot even follow the great lines of Shakespeare's dramatic plan, how shall we regard the rest of its failures—its failure to reproduce the great mass of his noble verse, or to preserve the consistency and rich abundance of his dramatic detail? And if our confidence in the pirated edition as a whole is so sorely shaken, what confidence can we place in any passage of the Quarto where it seems to be eking out and patching together all that it is able to present of the true and perfect text? What evidence would be sufficient to satisfy us of the authenticity of any passage of which it might be suggested that *that* at least may have been antecedent to the longer play? And are we not already justified in asking whether if fraudulent fabrication can be made to account for all or most of the peculiar features of the Quarto, the idea of a third text, common to it and to Shakespeare's perfect play, need be forced upon us to make confusion worse confounded? That idea of a third text, moreover, must stand or fall with the related notion of a revision by the poet of his first draft of the tragedy; and why should we be asked to entertain such an idea when the evidence chiefly relied upon to support the theory of revision—that difference in the order of the various scenes as dealt with above—has proved in our hands its strongest refutation?

But something still remains to be said in this paper about certain important passages omitted by the First Quarto, especially of the omission of the greater part of Hamlet's speech at midnight on the ramparts of Elsinore; of his second remorseful soliloquy; and of that conversation with Horatio which occupies eighty lines at the beginning of Act V., Sc. 2, and of which only the last few lines are reported in the Quarto. Those who consider Q1 an early version of the play are of course precluded from laying any great stress on the first two omissions from the fact that the speeches referred to are also omitted by the Folio of 1623. Now, while it would be absurd to argue *with regard to the Folio* that, because these passages were omitted by it, they did not exist when the

Folio was printed, yet it is just possible to argue that they did not exist in their full form when the First Quarto (dated 1603) was printed, seeing that we find them first in the Second Quarto of 1604. With regard to such an argument, we have already pointed out that the argument from silence is a very precarious one to rely upon in the case of a text like the Quarto which is so very deficient as a whole. But in comparing the text of the Folio of 1623 with the text of Q1, at the points where these two passages are omitted, a curious fact emerges to which we invite some careful attention. We wish first to say that in the Folio the missing passages are plainly excisions, and that they have been excised in such a way that not a word, not a line of Shakespeare, has been tampered with except by omission. Nor is this all; for from the text of the Folio we can deduce the pre-existence of the literary matter that has been excised. For we find that in the Second Quarto, where it is given in full, Hamlet's midnight speech ends on the half-line "to his own scandal," a line which is completed by Horatio's cry "Look my lord, it comes," so that when the First Folio after the excision starts again with Horatio's cry, this half-line preserved by the Folio is plainly related to the other half "to his own scandal," which we find only in Q2. Again, we find that in the Second Quarto the short conversation between Fortinbras and one of his captains at the beginning of Act IV., Sc. 4, ends with the half-line, "Go softly on," which is completed by the words of Hamlet, "Good sir, whose powers are these"—words of course which open the conversation with the captain that leads straight on to Hamlet's remorseful soliloquy. The Folio stops at "Go softly on," omitting both the conversation with the captain and the soliloquy to which it leads.

Turning now to the text of the First Quarto, what is it we discover there? Just this—the same marks of a literary excision that we find in the First Folio. In the case of the midnight speech, the two texts are the same almost to a syllable at the point of excision. In the case of the interview between Fortinbras and his captain, the report given in Q1 is blurred and jumbled after the Quarto's usual fashion, but the passage is practically the same as in the Folio, and the words "goe march away" are a very respectable imitation of "go softly on." This curious coincidence in the texts of the First Folio and the First Quarto need not surprise us. For, as the writer has shown in a previous paper on the "Sources of the Hamlet Tragedy," the First Quarto with all its deficiencies

would seem to rest upon a more catholic basis than either the Second Quarto or the First Folio, since as a "text it shows familiarity with five different passages given in the former and omitted in the latter, and is familiar with the same number of passages given in the latter and omitted in the former—a fact which does not favour the idea that it is an early sketch of the drama." Had it been a first draft of the play, upon examining the context where what we have called the "excisions" occur, we might have found traces of a first intention on the poet's part to stop just where the First Quarto makes him stop. In that case the additional matter of Q₂ would have assumed the appearance of an afterthought, and might have supported the hypothesis of a later revisal of the poet's work. As it is, the evidence points the other way. It seems to show that the longest version of the play was the earliest of all, and that the shorter versions are later and derivative. We know it was so in the case of the Folio of 1623—is there any good reason for thinking it was otherwise in the case of the Quarto of 1603? It may be worth while to add with regard to its report of the conversation between Fortinbras and his captain that the First Quarto, as it so often does, inadvertently bears witness to the existence of the very passage it has omitted, for it makes the former describe himself as "Fortinbrasse, nephew to old Norway," a description he should have left to the captain, who in the current play so speaks of his master in answer to Hamlet's question, "Good sir, whose powers are these and who commands them sir?" By this reminiscence from an interview which it does not report, the Quarto bears witness that the poet's first intention was not to leave the speech of Fortinbras to be a perplexing obstruction in the course of the drama, as unexpected and unwelcome as an iceberg in mid-Atlantic. From the very first, he planned that Fortinbras and Hamlet should miss one another; but that Hamlet should *hear* of the expedition of Fortinbras from the lips of the Norwegian captain, and should have a second opportunity in the tragedy of raving against himself in his own romantic fashion and measuring himself against "all occasions" that could rouse him to morbid self-abuse.

We must now deal as briefly as possible with the omission of Hamlet's conversation with Horatio (Act V., Sc. 2) which should be dealt with along with the fact that the Quarto omits Shakespeare's account of Hamlet's return to Denmark, and of the way in which he turned the tables upon Rosencrantz and Guildenstern, sending

them to the death to which they were conveying himself. Now, if Shakespeare in his first draft of the tragedy could be supposed to have so shaped it that he brought his hero back to Denmark and sent his custodians to their death in England without inserting in his story any explanation of this wonderful reversal of fate, he must surely have written it *without a plan at all*; and how then are we to conceive why he went on to finish a play in which he had left so hideous a gap, how could he bring himself to work out Act V. so carefully that in the First Quarto it is as complete in episode, characterisation, and versification, as if it were, what we have taken it to be, a slavish but rude copy of the last act of a highly finished drama? The hideous gap is in the Quarto, but that Shakespeare is in any way responsible for it we refuse to believe. And certainly, if we had nothing but the version of the Quarto to rely upon for the details of Hamlet's return, our wonderment at the mystery might well be as great as that of the King, whom the Prince has left in utter ignorance, and who is made in the Quarto to gasp out in breathless and unrhythmical dismay,

Hamlet from England! is it possible?

What chance is this? they are gone and he come home.

The Quarto insults us with a promise that the mystery will be explained in what Horatio calls "the next conversation with your grace," by which he means the next conversation Hamlet has with his mother; but the promise is a mean dramatic subterfuge, indicating that the patching-editor is not wholly unconscious of the gap in the drama to which we have referred. To bridge this chasm he has nothing better than the flimsiest and most disreputable material that can be scraped together to meet a dramatic emergency.

To meet such an emergency, he has nothing better to offer than the dialogue between Horatio and the Queen—one of the greatest curiosities of the pirated edition—which, though it has been fabricated for the purpose of filling a gap, is not without some interesting echoes or reminiscences of the literary matter, as a whole, forgotten or lost. The dialogue is unique and delightful in so far as it is all so regularly and formally conducted. There are no painful lapses of memory in the course of *this* conversation, no sudden descent from Shakespeare's poetry to Quarto jargon. Horatio and the Queen acquit themselves with credit as Quarto puppets inspired and manipulated by the patching-editor. The

dialogue is as freely besprinkled with "Horatios" and "Madames" as if the speakers were sore afraid their remarks to each other might go astray like unaddressed Marconi messages. Yet even in this passage, the editor's inventive genius is not altogether free. He tries to give the conversation a Shakespearean flavour, or his memory is unconsciously haunted by scraps of the original text, so much of which he was compelled to omit. Thus the phrase "sugar o'er" is stolen from the well known lines,

We do sugar o'er

The devil himself.

The "Packet" twice referred to, is the packet Hamlet groped after and fingered in the dark. "He will relate the circumstance at full" is probably an echo of Hamlet's words to Horatio, "You do remember all the circumstance." "To-morrow morning" is a curious date recalling "To-morrow shall I beg leave to see your kingly eyes;" while "he being set ashore" may be a reminiscence of "I am set naked on your kingdom." "The east side of the Cittie," if it has nothing in it of a literary flavour, is suggestive of something personal to the patching-editor himself.

Quite recently, the writer of this paper on the First Quarto of *Hamlet* was much interested in a press notice of the latest volume of the Tudor and Stuart Library, viz., Shakespeare's "*Merry Wives of Windsor*," edited by W. W. Greg, Litt.D., from which the following sentences may here be quoted:—"The text follows the Quarto of 1602. The relation of the Quarto to the First Folio forms one of the most fascinating problems of Shakespearean textual criticism, and Dr Greg analyses it at considerable length. His discussion is noteworthy for the new hypothesis which he submits for the origin of the Quarto version, viz., that it was reproduced from memory for the benefit of the pirate printer by the actor who took the Host's part." Such a verdict on a pirated edition of the *Merry Wives of Windsor* is not only in curious accord with the conclusions we have arrived at with regard to the First Quarto of *Hamlet*, but suggests the possibility that the actor who served as literary hack in the printing of the *Hamlet* Quarto may yet be successfully identified with the actor who played the same part in the printing of the *Merry Wives of Windsor*.

The Youth and Early Manhood of James Boswell. By J. T. T. BROWN, *President of the Historical and Philological Section.*

[Read before the Society, 23rd March, 1910.]

THE contemporary estimates of James Boswell are conflicting as contemporary estimates so often are. To those who only met him casually or watched him flitting about in society he seemed a vain, shallow, eccentric, mad kind of creature "with a rage for knowing anybody that was ever talked of." Neither love of scandal nor any special ground of envy need be imputed to those who formed that opinion of him. Men have always judged their fellows by appearances, and Boswell's frailties, not his virtues, lay open to the world. His better qualities were discerned only by a few intimates—the élite of the eighteenth century—to whom, during the thirty-five years in which he was a prominent figure in Edinburgh and London society, he unbosomed himself. By these friends he was regarded as a man of considerable intellectual powers, whose conversational talents were always pleasing and often fascinating; with an inexhaustible fund of good humour and good nature; extremely warm in his attachments, and withal, religious.

The testimony of these friends unquestionably furnishes the best evidence, and a judicial criticism must begin by accepting it as, in the main, trustworthy, even though it appear sometimes to be coloured or heightened by friendship.

It is not so difficult, as at first sight it seems to be, to reconcile the divergent opinion concerning the man himself: it is much more difficult to understand the contemporary criticism of his works. Nobody in the eighteenth century assigned to him his true place and magnitude as an author. Johnson admired the *Journal of a Tour in Corsica*, and read with appreciation the manuscript notes made by his companion during the journey among the Hebridean Islands: but there is nothing to indicate recognition of any uncommon literary ability. The truth seems

to be that Boswell's literary powers were either underrated or altogether denied. "Any fool may write a most valuable book by chance, if he will only tell us what he heard and saw with veracity"—Gray's contemptuous allusion to the *Journal of a Tour in Corsica*—seems to be the canon by which, for nearly half a century, all his works were judged. Macaulay's essay on *Johnson* published in 1830, so far as it concerns Boswell, is nothing more than Gray's paradoxical antithesis writ large—the foolishness of the biographer, and the greatness of his book. "Many of the greatest men that have ever lived," says Macaulay, "have written biography. Boswell was one of the smallest men that ever lived, and he has beaten them all. . . . If he had not been a great fool he would never have been a great writer. . . . We remember no other case in which the world has made so great a distinction between a book and its author. In general the book and the author are considered as one. To admire the book is to admire the author. The case of Boswell is an exception, we think the only exception to the rule." From beginning to end the essay is a tissue of misstatements. There is scarcely a sentence that will bear investigation. What, for example, is to be said of an assertion like this?—"Boswell was, if we are to give any credit to his own account or to the united testimony of all who knew him, a man of the meanest and feeblest intellect. . . . We do not remember ever to have read or ever to have heard any expression of respect or admiration for the man to whom we owe so much instruction and amusement." To such reckless criticism Mr Augustine Birrell surely refers when he says—"Macaulay's style—his much praised style—is ineffectual for the purpose of telling the truth about anything. It is splendid, but *splendide mendax*."

Against Macaulay's caricature—for it is as truly caricature as anything that Wolcote (Peter Pindar) ever wrote about Boswell—we can set Carlyle's essay on *Johnson*, written about a year later. It is notable as the first honest attempt to appreciate Boswell and his *magnum opus*, and as an antidote to the earlier essay deserving of all praise. It perhaps unduly emphasises Boswell's weaknesses; but it atones for any fault on that score by bringing out in bold relief the better qualities of the man and recognising fully the great merits of his book.

These essays were inspired by Croker's edition of the *Life of*

Johnson, a fact too often left out of sight by those who read them. In annotating the work, the nineteenth century editor brought into his footnotes all the gossip and scandal concerning Boswell that could be gathered; much of it untrue, most of it, owing to the manner in which it is presented, calculated to convey an utterly false impression. But neither Macaulay nor Carlyle, in their merciless castigation of Croker, takes due account of his unfair treatment of Boswell; on the contrary both freely use the material—Carlyle particularly—in their portraits of the biographer. Time, however, has been on his side. Since Macaulay and Carlyle wrote there have been accessions to our knowledge, documents discovered that shed new light and furnish new evidence of the first importance.

Foremost among these are the letters of Boswell to William Johnson Temple—grandfather of the late Archbishop of Canterbury—with whom he had formed while a student at Edinburgh University one of those ideal friendships “that fill the life of generous youth as ambition fills an energetic manhood.” They extend from 1758, the year when Temple left Edinburgh, down to 1795 when Boswell died. Few literary discoveries are more extraordinary. In the year 1851 a clergyman having occasion to purchase some small article at a shop in Boulogne chanced to notice that the paper in which it was wrapped was a fragment of an English letter. Upon inspection, a date and some names were discovered, and further investigation shewed that the piece of paper was part of a letter from the biographer of Johnson to his life long friend Temple. On making enquiry, it was ascertained that it had been taken from a large parcel recently purchased from a hawker who was in the habit of passing through Boulogne for the purpose of supplying shops with paper. The whole letters were fortunately secured, and in 1857 published by Richard Bentley.

Shortly after Boswell's death, his library in his London house was dispersed—among other books a portfolio, which was acquired by a private collector with whom it remained for upwards of 60 years. It was again sold in 1861, and eventually passed to Monckton Milnes (better known now as Lord Houghton) who allowed it to be published in 1874. It proved to be a commonplace book of Boswell in which he had recorded from time to time private conversations and sayings of many eighteenth century celebrities, as well as many observations of his own—memoranda

intended doubtless to be used at some future time. Some of the entries indeed had appeared in a revised form in the *Life of Johnson*, most of them had never seen the light. But there is still another find to record as remarkable as either of those mentioned—I refer to the Diary of the Reverend Thomas Campbell. This Diary after reposing behind an old press in one of the Offices of the Supreme Court of New South Wales, for no one knows how long, was brought into light and published in Australia, being printed for the first time in this country by Napier in his edition of the *Life of Johnson* in 1884. Dr Campbell, an Irish Clergyman, visited London in 1775 and met Johnson and his circle. He reports many of the same conversations as Boswell, some of them even more fully, and it is curious to trace the agreements and differences. Its value is that it proves not only the veracity of the biographer but also his unrivalled dramatic power in the presentation of dialogue. Criticism of Boswell without access to these three recent discoveries is like digging for water with a full river in sight.

I shall not attempt to-night to make use of all that material ; to do so would be impossible within the compass of an hour's lecture. I have preferred rather to limit my subject to the Youth and Early Manhood of Boswell, and particularly to the period between 1758 and 1768. These early years, unless I am mistaken, are less known than they deserve to be. It is in that decade we discover the unbroken course of literary development and the preparation for the life task. To-night, consequently, little will be said concerning the *Tour to the Hebrides* or the *Life of Dr Johnson*. The earlier work, *The Journal of a Tour in Corsica*, strangely forgotten in these days of cheap reprints, will more particularly invite attention.

In the case of Boswell, if we are rightly to appreciate his works, it is important to know the influences which moulded him and the external circumstances of his life : and for that reason I shall begin by sketching his career, with rapid brevity, between the age of 19 and 29, bringing into the narrative here and there letters to Temple, Wilkes and other friends, which will shew his powers as a letter writer.

James Boswell was born at Edinburgh on 29th October, 1740. He was the eldest son of Alexander Boswell of Auchinleck, better known by his judicial title Lord Auchinleck, and Euphemia

Erskine, daughter of Colonel Erskine of Alloa. Proud of his long pedigree, he never lost any opportunity of publishing it. By the marriage of his grandfather with a daughter of the Earl of Kincardine, he boasted that the blood of Robert the Bruce flowed in his veins. Through his own mother he claimed kinship with the Earls of Mar and Dundonald. Lord Auchinleck is described by Ramsay of Ochtertyre, who knew him intimately, as an able lawyer and painstaking judge, a staunch presbyterian with strong antipathies to everything episcopal, a zealous whig abjuring the Stuarts, a man of scholarly tastes, but at no pains to improve his "colloquial Scots" and out of sympathy with the Edinburgh *literati* who found pleasure in imitating English classics. Of the childhood and boyhood of the biographer almost nothing is known. A licentiate of the Church of Scotland, as one might expect, was his domestic tutor: at the Edinburgh High School he perfected his rudiments. When we get our first authentic view of him as a law student, about 18 years of age, at the end of his first session at Edinburgh University, there is nothing by which we can recognise him as the son of his father. His creed is pronouncedly episcopalian, his politics high tory, his sympathies altogether with Robertson, Hume and other *literati*.

It was the fervent desire of Lord Auchinleck that his eldest son should be an advocate, and the boy's education had all been directed towards that end. But the son himself had other ideas. He wished to enter the Army and to obtain a Commission in the Guards; his legal studies were irksome and uncongenial. Father and son were thus early at cross purposes, and they knew it. Already at the age of 19 Boswell was becoming intractable and rebellious. He was a confirmed playgoer, a friend of actors, a frequenter of public balls, the founder and president of the Soapers, a convivial club which held its meetings weekly in a tavern. At the club, where he sang songs and spouted facetious verses of his own, he was looked on by his cronies as the leading wit and a king of goodfellows. Clubability, one of his characteristics singled out by Dr Johnson for praise many years later, was natural to him and scarcely needed to be cultivated. The theatre, banned by the church, was under the patronage of the smart set of the time, the Jacobites and tories, and as matter of course he was on the side of the party of fashion.

Two letters to Temple, written in 1758, may be glanced at in

passing, as they evince other Boswellian traits in their incipient stage. In the earlier epistle he tells his friend of his first meeting with David Hume :—"Some days ago I was introduced to your friend Mr Hume : he is a most discreet, affable man as ever I met with, and has really a good deal of learning and a choice collection of books. He is indeed an extraordinary man—few such people are to be met with now-a-days. We talk a great deal of genius, fine language, improving our style, etc., but I am afraid solid learning is much wore out. Mr Hume I think is a very proper person for a young man to cultivate acquaintance with. Though he has not perhaps the most delicate taste, yet he has applied himself with great attention to the ancients, and is likewise a great historian, so that you are not only entertained in his company, but may reap a great deal of useful instruction."

On 16th December, four or five weeks after the commencement of his third session at Edinburgh University, he writes expressing the hope that his friend, then a resident student at Cambridge, may preserve his "amiable character amidst all the deceitful blandishments of vice and folly" at that seat of learning. "I can assure you," he goes on to say, "the study of the law *here* is a most laborious task. In return for yours I shall give you an account of my studies. From 9 to 10 I attend the law class ; from 10 to 11 study at home ; and from 1 to 2 attend a College upon Roman antiquities ; the afternoon and evening I likewise spend in study : I never walk except on Saturdays.

"During the vacancy in harvest, I went along with my father to the Northern Circuit, and was so happy as to be in the same chaise as Sir David Dalrymple the whole way. I kept an exact journal at the particular desire of my friend Mr Love, and sent it to him in sheets every post. He is really a man who I must say is my second best friend. . . . The poem you have obliged me with is very pretty. . . . To encourage you I have enclosed a few trifles of my own. . . . I have published now and then the production of a leisure hour in the magazines. If any of these essays can give entertainment to my friend I shall be extremely happy."

The Mr Love who suggested the keeping of the diary was the leading actor in Edinburgh. Sir David Dalrymple, then newly appointed an Advocate depute, is of course the future judge Lord Hailes who figures in the biography, one of Boswell's best mentors

all through life. It was from him, during this circuit journey, that he heard of the great Cham of letters, Dr Johnson.

It may be that Boswell began the winter session with high resolves: more than likely he did; but certain it is he did not long maintain his diligence. Literature, the theatre, fashionable visits, meetings of the Soapers, stole a goodly portion of his afternoons and evenings. A crisis was reached in 1759. About October or November (the date is uncertain) he had been mainly responsible for bringing on the stage a comedy entitled *The Gallant in the Closet*, a translation from the French made by a distant relation, Lady Houston—"a very extraordinary performance," says Ramsay of Ochertyre, who records the incident, "to which he not only wrote a prologue but some of the scenes." It was a failure, and as Boswell was supposed to be the author, his name for a time was in everybody's mouth. Lord Auchinleck, who never forgot his position as a Senator of the College of Justice, was scandalised and indignant; his son and heir was disgracing him.

It was no doubt to remove the youth from temptations which beset him in Edinburgh that his father summarily transferred him to Glasgow University, where he matriculated in November, 1759, at the beginning of the winter session. He attended the civil law class and also the lectures of Professor Adam Smith, but the hours out of class were not all spent in assimilating law, moral philosophy, and economics. In the Western City many of his evenings were passed at the booth, which then served for a theatre, erected against a wall of the old Bishop's Palace in High Street, and actors were, as in Edinburgh, among his boon companions. A tragedy entitled *Oroonoco*—then a great favourite on the stage—was edited by a Glasgow actor named Gentleman, and published at the Foulis press in 1760 with a dedication to Boswell, then 20 years of age. The dedicatory verses, in the form of an address to the Muse, may have been written by Boswell himself: one of them will serve as a specimen—

But where with honest pleasure she can find
Sense, taste, religion and good nature joined,
There gladly will she raise her feeble voice,
Nor fear to tell that *Boswell* is her choice.

Mention of religion in the dedication is rather remarkable. In

several memoirs it is said that Boswell while in Glasgow commenced to attend a Catholic Chapel, and even meditated becoming a priest. The statement has probably been exaggerated. There was no Roman Chapel in Glasgow in 1760, members of that community, few in number, meeting in a clandestine manner in a dwelling-house in Blackstock's Land near the foot of the Saltmarket, four times a year, to hear mass when the Bishop of Edinburgh or his coadjutor visited the city. It seems far more likely that he may have attended the service on one or two occasions out of curiosity—the clandestine nature of the meeting being attraction enough to one with his proclivities. That he was for a time in sympathy with catholicism is certain, but his temporary conversion was probably more influenced by a priestess than by anything he heard from the itinerant bishop. At any rate, it was in 1760 that he eloped with an actress to London. Ramsay is again the chief authority: "Love, the actor," he says, "immediately acquainted Lord Auchinleck of it, telling him at the same time that the connection was not the more safe that the woman was a papist and reputed virtuous among them."

Concerning that escapade Boswell to the end of his life was discreetly reticent. In an autobiographical memoir which he contributed anonymously some thirty years later to a London magazine there is no lack of frankness on certain topics, but the elopement is not one of these. What happened on that first visit was something like this. Soon after his advent in London the runaway was discovered by Lord Eglinton who carried him to his house until Lord Auchinleck should arrive from Scotland. The meeting between father and son we can only imagine. They interviewed the Duke of Argyll and discussed the army as a career for the young man: so much we know from this passage of the autobiography:—"The Duke of Argyll talked for some time with him (Lord Auchinleck) and was pleased and seemed surprised that Boswell wanted to have a Commission in the Guards. His Grace took Lord Auchinleck aside and said, My Lord, I like your son. That lad must not be shot at for three and sixpence a day." It looks uncommonly like a charade cleverly acted by the two elderly gentlemen, intended to flatter the youngster that he was too good for the army. Be that as it may, it had its effect; arms yielded to the gown, and Boswell submissively surrendered—outwardly at least and for the time—to the paternal wish, accepting as his lot

the prosaic life of a Scottish advocate. Lord Auchinleck returned home leaving his son in care of Lord Eglinton to obtain from that nobleman what Ramsay not very happily terms "a Pisgah view of the gay world."

With his noble guardian, who was himself rakish and fashionable, Boswell had what in boys' parlance is called "a good time." He became acquainted with some of his lordship's friends, among others Derrick, the playwright, and John Wilkes, the politician, neither of them desirable companions for one so young. In the autobiography we are told that "he had acquired from reading and conversation an almost enthusiastic notion of the felicity of London, which he visited for the first time early in the year 1760, and his ardent expectations were not disappointed. He had already given some specimens of a talent for writing in occasional essays, both in prose and verse, without a name, and he soon obtained the acquaintance of many wits of the metropolis, having the late Mr Derrick as his introducer into 'many coloured life,' or as he has pleasantly expressed it, his *governor*." To the round of pleasures Lord Eglinton himself contributed. Boswell, who visited Newmarket with his patron, had there what he called "a whimsical adventure." In the Jockey Club Rooms, being much stared at as a stranger, the idea occurred to him of calling for pen and paper and of writing some verses. This he did, and read his poem to the astonished members, the Duke of York being one of the audience. It bore the strange title *The Newmarket Cub*, which two years later he published, at his own cost, with a dedication to the Duke, and a preface in which he solemnly relates that "the hero of it is no other than the author himself. . . . It was indeed catching the merriment as it rose; for it was written in the Newmarket Coffee Room, in which the author, being elected a member of the Jockey Club, had the happiness of passing several sprightly good humoured evenings."

His revels ended in the Spring of 1761, when he was peremptorily recalled to Edinburgh—"hailed to Edinburgh" is his own phrase—to resume his legal studies under the personal supervision of his father. A characteristic letter to Temple of date 1st May, 1761, reveals his state of mind at this time. The friend, it is clear, has heard a good deal about Boswell's ongoing, and has been upbraiding him: here is the *Apologia pro vita sua*. "Indeed my dear Temple you wrong me, you are and ever shall be dear to

Boswell who reckons himself highly honoured by an intimacy with Mr Temple, and while he comforts himself with that, can calmly smile at the attacks of envy or malevolence. I find that you have had a very disagreeable account of my conduct for some time by post. I flatter myself that the apologetic letter which I wrote you lately may have put matters in a more favourable light. I grant you that my behaviour has not been entirely as it ought to be. A young fellow whose happiness was always centred in London, who had at last got there, and had begun to taste its delights, and who had got his mind filled with the most gay ideas—getting into the Guards, being about Court, enjoying the happiness of the beau monde, and the company of men of genius, in short everything that he could wish—consider this poor fellow hauled away to the town of Edinburgh, obliged to conform to every Scottish custom, or be laughed at—‘Will you hae some jeel; oh fie, oh fie’—his flighty imagination quite cramped, and he obliged to study *Corpus Juris Civilis*, and live in his father’s strict family: is there any wonder, Sir, that the unlucky dog should be somewhat fretful? Yoke a Newmarket courser to a dung cart and I’ll lay my life on’t he’ll either caper and kick most confoundedly or be as stupid and restive as an old battered post horse. Not one in a hundred can understand this: you do.”

If Roman Law engaged a goodly portion of the working days in 1761 and 1762, so also did literature: about that there can be no doubt. In a volume of *Miscellanies* printed in 1762 by Donaldson, the Edinburgh Bookseller, at least 30 pieces are by Boswell. In the same year he published anonymously an *Elegy on the Death of an amiable Young Lady*, with commendatory letters of friends—one by himself; and a few months later an *Ode to Tragedy by a Gentleman of Scotland*—also anonymous—with a dedication to “James Boswell, Esquire, for your particular kindness to me, and chiefly for the profound respect with which you have always treated me” But his energies were chiefly then concentrated on a volume which he and his kinsman the Hon. Andrew Erskine were busily collaborating—a series of Letters full of personal allusions to themselves as well as to their near relatives and acquaintances. It was published in London in 1763 with this truly Boswellian preface—“Curiosity is the most prevalent of all our passions, and the curiosity for reading letters is the most prevalent of all kinds of curiosity. Had any man in the three

Kingdoms found the following letters directed, sealed and addressed, with post marks, provided he could do so honestly, he would have read every one of them." Among other things of a personal nature, readers of that curious volume would learn that the *Ode to Tragedy* dedicated to James Boswell, Esquire, was from the pen of James Boswell, Esquire, for the fact is unblushingly confessed in one of the letters to Erskine.

Near the end of 1762 we find him back again in his dear London, on this occasion apparently with his father's consent. What led him thither, unless it was pleasure, is not now discoverable. A sentence in a letter to Temple (April, 1762) indicates that at that time he had again been hankering after the Army, for he confides—"I have now pretty good hopes of getting into the Guards:" but if that was the business which took him south in November, nothing came of it. He stayed till July, 1763, enjoying the fellowship of Temple—then sojourning in town; passing days pleasantly with old acquaintances, and assiduously enlarging his circle, Goldsmith, Lloyd and Churchill being some of the recent accessions.

I merely remind you, at this point, that it was on this visit to London that he first met Johnson. Everybody knows the triumphant passage in the Biography leading up to the classic scene in the back room of Mr Thomas Davis, the bookseller: "This is to me a memorable year: for in it I had the happiness to obtain the acquaintance of that extraordinary man whose memoirs I am now writing: an acquaintance which I shall ever esteem as one of the most fortunate circumstances of my life. Though then but two and twenty I had for several years read his works with delight and instruction, and had the highest reverence for their author, which had grown up in my fancy into a kind of mysterious veneration, by figuring to myself a state of solemn elevated abstraction in which I supposed him to live in the immense metropolis of London."

Let us turn now for a little and follow him on the Continent. He left London at the end of July for Utrecht, where for two years, according to the paternal plan, he was to study Civil Law. But the Dutch University town he found dull, and his spirits were grievously affected. To relieve the tedium he made excursions and paid social visits, the letters of introduction brought from home gaining for him easy access to many families of high social standing. His own affable manners and vivacious conversation brought him

other friends, and ere long he began to like his surroundings better. But by the end of a year, tired of the daily grinding at the Institutes and Pandects, he was on the wing again. From Holland he journeyed into Prussia, making his way to Berlin, where for some time he stayed with Sir Andrew Mitchell, the British Ambassador, an intimate friend of his father. From the house of that Minister he wrote home announcing his plan for an extended tour, and begging to be allowed to visit Switzerland and Italy. Meanwhile, until an answer arrived, he set out on a visit to Hanover and Brunswick. On his return six weeks later, he found his father's reply, refusing permission and peremptorily ordering a return to Utrecht. Not to be thwarted, his next move was an appeal to the Ambassador, then on holiday, to intercede for him. The letter is sufficiently characteristic to deserve quotation. Here it is :—"Your departure is a good deal unlucky for me, not only as it deprives me of conversation which gave me uncommon pleasure and invariably accustomed me to rational thinking and honourable sentiment, but because I now particularly stand in need of your prudent and kind counsel with respect to my travels. I have had another letter from my father, in which he continues of opinion that travelling is of very little use and may do a great deal of harm. I shall not repeat what I have formerly said of my father's particular character ; I say *particular*, for rarely will you find a man of so excellent a frame of body and so noble a mind as to have passed through life with uniform propriety of conduct. For my own part, I own that I am not such a favourite of nature. Think not that I intend to *plead machinery*, and escape from the censure due to the faults which I have committed. I only would have you consider that judgment is a natural gift as well as imagination, and force of mind is in a great measure independent of our endeavours : think of me as I am, and pronounce accordingly.

"I esteem and love my father, and I am determined to do what is in my power to make him easy and happy ; but you will allow that I may endeavour to make him happy and at the same time not be too hard upon myself. I must use you so much with the freedom of a friend as to tell you that, with the vivacity which you allowed me, I have a melancholy disposition. To escape from the gloom of dark speculation, I have made excursions into the fields of amusement, perhaps of folly. I have found that amusement and folly are beneath me, and that without some laudable

pursuit my life must be insipid and wearisome. I therefore took the resolution of leaving London, and settled myself for the winter at Utrecht, where I recovered my inclination for study and rational thinking. I then laid my account with travelling for a couple of years, but I found my father's views to be entirely different. You saw the letter which I wrote him from this, and I flatter myself that you approved of it. I cannot expect his answer for some weeks; in the meantime he tells me that he would not oppose my passing another winter at Utrecht, so that he does not grudge the time which I ask. As for the money, I should think for one year a little extraordinary expense is not thrown away, when it is also to be considered that what I spend now I shall not have some years hence. My father seems much against my going to Italy, but gives me leave to go from there and pass some months in Paris. I own that the words of the Apostle Paul, 'I must see Rome,' are strangely borne in upon my mind: it would give me infinite pleasure; it would give me talk for a lifetime, and I should go home to Auchinleck with serene contentment. I am no libertine, and have a moral certainty of suffering no harm in Italy. I can assure you that I shall be as moderate as possible in my expenses. I do not intend to travel as *Mi lord Anglois*, but merely as a scholar and a man of elegant curiosity, and I am told that in that character I may live in Italy very reasonably. I obviate your objection of my being obliged to live like others, by assuring you that I have none of that second rate ambition which actuates most young men of fortune upon their travels. After passing four months on classic ground I would come through France, and go home as I said to my father, *uti conviva satur*. Now, Sir, tell me fairly if I am unreasonable. Upon my honour I cannot think that I am. I give you my word that my father's inclination shall be as inviolable law to his son; but don't you think that I may just remonstrate before I consider an act as passed. Don't you think that rather than go home contrary to what I much desire, and cannot help thinking very proper—don't you think it worth while to honour me so far as to allow me my year and a reasonable sum, after which I return clear and contented, without any pretence for my stormy disposition to murmur at? I would beg, Sir, that you would write to my father your opinion as to this matter, and put it in the light you think it deserves. In the meantime I can see little advantage to be had at Berlin. I shall, however, remain here

a fortnight, after which I intend passing by Mannheim and one or two more of the German Courts to Geneva : I am then at the point from which I may either steer to Italy or to France. I shall see Voltaire. I shall also see Switzerland and Rousseau : these two men are to me greater objects than most statues and pictures. I take this opportunity to assure the loved and respected friend of my father that I am serenely happy at having obtained his acquaintance. I would hope that I shall not be found unworthy of his regard, and I wish very honestly for an opportunity of showing my real esteem for such a character as I could draw to any one else but to himself."

Probably deeming it hopeless to control one so wilful and so far away, Lord Auchinleck yielded a reluctant consent to his son's plan. The Ambassador, during the fortnight the youth waited in Berlin, would appear to have addressed some words of advice to him and received for his pains this rather extraordinary acknowledgment :—"I thank you for your letter from Spa, although it gave me no encouragement of going to Italy. You tell me gravely to follow the plan which my father prescribes, whatever it may be ; and in doing so I shall certainly act most wisely. I forgive you for this, for I say just the same to young people when I advise. To enter into detail of the little circumstances which compose the felicity of another is what a man of any genius can hardly submit to. We therefore give a good, wholesome, general counsel ; and he who consults us, thinks a little, and then endeavours to take his own way as well as he can. I have, however, the happiness to inform you that my father has consented that I shall go to Italy. Upon my soul, I am grateful to the most worthy of men ; it will be hard if we are not well together, for I love him with the strongest affection. If I find that I cannot succeed in my own plans in such a way as to convince my father that I am in the right, I shall do my utmost to fulfil the plan, beyond which he cannot think to look. You may suppose what my ideas are, for they are of your old acquaintance. One thing I am sure of, and by the undisguised honour of a man of probity I swear, shall chiefly influence me—a regard to the happiness of him to whom I owe so much. *Believe me I have a soul.*"

The grand tour outlined in these letters was duly carried out. For guide through Germany Boswell had the Earl Marischall of Scotland. In Switzerland he accomplished the visit to Rousseau

and Voltaire. Crossing the Alps he arrived at Rome, lodging there for a time, and then proceeded to Naples, where to his intense delight he found John Wilkes, then living abroad to escape prosecution by the Bute Government for sedition and libel. With that notorious Whig whom Gibbon met in 1760 and described as the best of companions, a man of infinite wit and humour, but a thorough profligate in principle as in practice, the young Tory enjoyed "many classical scenes with peculiar relish." After a stay of some weeks, he returned to Rome, where chancing to fall in with a cousin who introduced him to Lord Mountstuart, son and heir of Wilkes's great political enemy, a new friendship was begun. Boswell's vivacity was so attractive indeed, that the young nobleman proposed that they should travel together. He even wrote to a friend in Scotland describing Boswell as "an excellent lad full of spirit and noble sentiment" who "rouses one up whether you will or not," and asking that the proposal might be made to Lord Auchinleck. While this new friendship was ripening, a brisk correspondence was being maintained between Boswell and Wilkes. The letters of Boswell, adorned with classical quotations, are full of gay good humour, with occasional moments of seriousness.

I can only give a few selections chosen at random :—"I do in my conscience believe you to be an enemy to the true old British Constitution, and to the order and happiness of society. That is to say, I believe you to be a Whig and a very libertine. But philosophy can analyse human nature, and from every man of parts extract a certain quantity of good. Dare I affirm that I have found cheerfulness, knowledge, wit and generosity even in Mr Wilkes? I suppose few crucibles are so happily constructed as mine, and I imagine that I have a particular talent for finding the gold in Honour's composition."

At another time he is daringly audacious :—"In the Italian Gazettes they have thought proper to give you the epithet of *Il Bruto Inglese*. *Bruto* in Italian may signify either *Brutus* or *ugly*, and you must know, it is disputed between your friends and your enemies whether the epithet ought to be translated *the English Brutus* or *the ugly Englishman*. Much may be said on both sides."

In another of the letters there is this sally at his friend's infidelity :—"I am not displeased to find you can be melancholy. The loss of Churchill is no doubt the severest affliction you could

meet with. Pray let me be serious and advise you to seek consolation from the immortality of the soul which your departed friend strongly defends in the *Duellist*. The arguments for that noble system which indicates the Divine justice are surely strong, and it depends on ourselves to cultivate elevating hope. It was the prospect of meeting the renowned and worthy of former ages that made Cicero say *Si in hoc erro, libertus erro*. I heartily wish that John Wilkes, who has his mind so well stored with classical ideas, had this one in daily remembrance."

In another of the letters there occurs this strange apostrophe; and sudden transition to the introspective mood so peculiarly Boswellian:—"O, John Wilkes, Thou gay, learned and ingenious private gentleman, thou passionate politician, thou thoughtless infidel; good, without principle, and wicked, without malevolence, let Johnson teach thee the road to natural virtue and noble felicity. I have not made two verses this last two months. I have the most inconstant mind in the world. At times I can hardly help becoming a man of considerable parts, but at other times I insensibly fall into a state little better than a blockhead."

From Rome (April, 1765) he dispatched a letter to Rousseau asking for an introduction to Pascal Paoli, the Corsican General, informing the philosopher that if it was refused he should certainly go without it, and probably be hanged as a spy. The journey to Corsica was part of his settled plan from the time he had met Rousseau in Switzerland; but in the interval of waiting for a letter from his father, Lord Mountstuart and he together visited Bologna, Mantua, Venice and other cities, returning some four months later to Florence. There Boswell found Rousseau's introduction, and learned that his father forbade any prolongation of the tour. Fired now with his ambitious and romantic exploit to see Corsica and meet Paoli, he proceeded north, and embarking in a Tuscan vessel at Leghorn bound for Cape Corso, landed on the island in the harbour of Centuri. The story of that adventure is the theme of his *Journal of a Tour in Corsica*, to be noticed immediately. At the very end of November he returned to Genoa and leisurely journeyed to Paris. From Lyons, on 4th January, 1766, he sent a long letter, written in French, to Rousseau recounting his experiences. Here are a few extracts:—"At last I see day. For many months I have been uncertain into what corner of the world you have retired, and know not where to address a letter to.

. . . . I wrote from Leghorn on the eve of my sailing for Corsica. I was six weeks in the island. I saw much of its inhabitants. I enquired into everything with that diligence which you know I can exert. I knew the brave Paoli intimately. I have treasures to communicate to you. . . . I am under the greatest obligations to you for having sent me to Corsica. This expedition has done me a world of good. It is as though the whole of Plutarch's lives had dissolved within me. Paoli has soothed my soul in a way that it will never lose. I am no longer the delicate, restless being who was complaining in the Val de Travers. I am a man, I think for myself. You have given me a new birth. . . ."

"It is reported that you go to England. What a delightful prospect for me. I am certain there is not a man in the world more eager to contribute to your happiness than I am; and you too may be sure of it. In due time you will trust in my Lord Marischal's young friend. I look forward with perfect enjoyment to making you acquainted with Mr Johnson, of whom I talked so much to you at Motier, and of whom you said 'I shall love that man: I shall respect him:' that too after being told that he had little respect for you. But I know you both, and though one uses his strength to support the wisdom of ages, the other to support the dream of his sublime and singular soul, I am certain both your great souls will meet in warmth. You will visit Scotland, see our romantic country: Rousseau will meditate among the venerable groves of my ancestors; and will believe with me that nymphs, genii, angels and all kinds of happy and benevolent spirits hold their choirs there. Adieu"

His tour was nearer its end than he imagined when he penned that rapturous letter to the French philosopher. The intention was to pass the winter in Paris, but news of his mother's death which reached him soon after his arrival made him turn his face homeward. In London, pleasant reunions with Johnson, Goldsmith and other friends, and an interview with Lord Chatham on Corsican affairs, detained him for ten days: early in March he was again under the paternal roof, after an absence of nearly three and a half years. Five months later, 26th July, 1766, he donned the Advocate's gown.

The two succeeding years will not detain us long. As an advocate he began well. "I am advancing fast in the law. I am coming into great employment," is the jubilant report to Temple

at the end of the first winter session. But his mind instinctively, rather than his will consciously, was drawing him in another direction. Here is an entry in the Common Place Book, a pleasantry no doubt, but none the less significant :—" After putting on the gown he said with great humour to his brother advocates—Gentlemen, I am prest into the service here, but I have observed that a prest man either by land or sea, after a little, does just as well as a volunteer." Literature, not law, was to shape his history : and with literature were linked the social pleasures which his nature craved.

In the letters to Temple during these two years, what a complex character is revealed ! His friend, now in holy orders and perpetual curate of a living in Devonshire, is solemnly admonished for his "specious morality" :—"Don't you talk of the tares of society? My friend, it is your office to labour cheerfully in the vineyard, and if possible to leave not a tare in Mamhead In a word, my dear Temple, be a good clergyman and you will be happy both here and hereafter." In the same letter he confesses, even defends, a gross irregularity in his own life. He congratulates his friend on his approaching marriage, while proclaiming himself a Benedick :—"A bachelor has an easy, unconcerned behaviour which is more taking with the generality of the world than the behaviour of a married man can possibly be, if he acts in character. The bachelor has a carelessness of disposition which pleases everybody and everybody thinks him a sort of common good, *nunc mihi, nunc aliis benignus*—a feather which flies about and lights now here now there." And yet it is not altogether inclination that keeps him single. "I cannot think of it while my father lives ; his notions and mine are so different that the wife whom I would choose would in all probability be very disagreeable to him. If he does not marry again, there is a duty upon me to live with him and be careful of him. His character is such that he must have his son in a great degree of subjection to him." In the very next letter (30th March, 1767) the wind has changed—"My life is one of the most romantic that I believe either you or I really know of ; and yet I am a very sensible good sort of man." Repentant for past follies, he now confesses that there are two charmers, with either of whom he might be happy. The favourite is a young lady in the neighbourhood of Auchinleck—"just eighteen, a genteel person, an agreeable face, of a good family,

sensible, good tempered, cheerful, pious. You know my grand object is the ancient family of Auchinleck—a venerable and noble principle. How would it do to conclude an alliance with the neighbouring princess, and add her lands to our dominions. I should at once have a pretty little estate, a good house and a sweet place. My father is very fond of her : it would make him perfectly happy : he gives me hints in this way :—‘ I wish you had her ; no bad scheme this ; I think a very good one.’ . . . My fair neighbour was a ward of my father, she sits in our seat at church in Edinburgh ; she would take possession here (i.e. Auchinleck) most naturally.” In June he confides to his friend more of his wooing, and begs him to visit Scotland. “ Come to me, my Temple, and on that Arthur Seat, where our youthful fancies roved abroad into extravagant, imaginary futurity, shall we now consult together on plans of real life, and solid happiness.” “. . . The lady in my neighbourhood is the finest woman I have ever seen. I went and visited her, and she was so good as to prevail with her mother to come to Auchinleck, where they stayed four days, and in our romantic groves I adored her like a divinity. I have already given you her character. My father is very desirous I should marry her—all my relations, all my neighbours approve of it. See looks quite at home in the house of Auchinleck. Her picture would be an ornament to the gallery.” The comedy runs through several letters, Temple himself being induced by his importunate friend to assume an important rôle at a critical juncture ; the last scene is vividly portrayed on 24th December, 1767. “ On Monday forenoon, I waited on Miss Blair. I found her alone and she did not seem distant ; I told her that I was sincerely in love with her, and that I only dreaded those faults which I had acknowledged to her. I asked her seriously if she now believed me in earnest. She said she did. I then asked her to be candid and fair as I had been with her, and to tell me if she had any particular liking for me. What think you, Temple, was her answer ? “ No : I really have no particular liking for you : I like many people as well as you.” Temple, you must have it in the genuine dialogue.

“ *Boswell.*—Do you indeed ? Well I cannot help it : I am obliged to you for telling me so in time. I am sorry for it.

“ *Princess.*—I like Jenny Maxwell (Duchess of Gordon) better than you.

“ *Boswell.*—Very well : but do you like no man better than me ?

“Princess.—No.

“Boswell.—Is it possible that you may like me better than other men?

“Princess.—I don’t know what is possible.

(By this time I had risen and placed myself by her, and was in real agitation.)

“Boswell.—I’ll tell you what my dear Miss Blair, I love you so much that I am very unhappy if you cannot love me. I must, if possible, endeavour to forget you. What would you have me do?

“Princess.—I really don’t know what you should do.

“Boswell.—It is certainly possible that you may love me; and if you should ever do so, I shall be the happiest man in the world. Will you make a fair bargain with me? If you should happen to love me, will you own it?

“Princess.—Yes.

“Boswell.—And if you should happen to love another, will you tell me immediately, and help me to make myself easy?

“Princess.—Yes, I will.

“Boswell.—Well you are very good (often squeezing and kissing her fine hand while she looked at me with those beautiful black eyes).

“Princess.—I may tell you as a cousin, what I would not tell to another man.

“Boswell.—You may indeed. You are very fond of Auchinleck, that is one good circumstance.

“Princess.—I confess I am. I wish I liked you as well as I do Auchinleck.

“Boswell.—I have told you how fond I am of you; but unless you like me sincerely I have too much spirit to ask you to live with me, as I know that you do not like me. If I could have you this moment for my wife I would not.

“Princess.—I should not put myself in your offer though.

“Boswell.—Remember you are both my cousin and my mistress, you must make me suffer as little as possible, as it may happen that I may engage your affections. I should think myself a most dishonourable man if I were not now in earnest, and remember I depend upon your sincerity: and whatever happens you and I shall never have another quarrel.

“Princess.—Never.

“Boswell.—And I may come and see you as much as I please?

“*Princess.*—Yes.

“My worthy friend, what sort of a scene was this? . . . Yesterday I saw her again: I was easy and cheerful and just endeavoured to make myself agreeable. This forenoon I was again with her. I told her how uneasy I was that she should be three weeks absent. She said I might amuse myself well enough: she seemed quite indifferent. . . . Temple, where am I now? What is the meaning of this? I drank tea with her this afternoon and sat near four hours with her and her mother. Our conversation turned all on the manner in which two people might live. She has the justest ideas. She said she knew me; she could laugh me out of my ill humour; she could give Lord Auchinleck a lesson how to manage me. Temple, what does the girl mean? We talked a good deal of you; you are a prodigious favourite. Now, my worthy friend, assist me. . . . Consult Mrs Temple and advise me. Amidst all this love, I have been as wild as ever.”

Is there not more than the germ of the inimitable biographer in that letter?

But the correspondence shows another side of the man:—“I am surprised at myself,” he says, “I already speak with so much ease and boldness, and have already the language of the bar at command. . . . My clerk comes to me every morning at six, and I have dictated to him forty folio pages in one day. . . . It is very odd that I can labour so hard at law when I am indolent in other things.” Indolent! The plain truth is Boswell never knew what indolence meant. All through 1767 he was hard at work on his Corsican book: “I am now (March 30th) seriously engaged in my account of Corsica; it elevates my soul and makes me *spernere humum*. I shall have it finished by June.” In September, he says:—“The press is opened and my book is fairly set agoing.

O navis, referent in mare te novi.

The proof sheets amuse me finely at breakfast. I cannot help hoping for some applause.”

The daily routine and the writing of the *Corsican Journal* would have satisfied most men, but he had at that very time other irons in the fire. The Douglas Cause, the most famous law suit that ever engaged the Scottish Courts, was in the early summer of 1767 ripening towards decision. Boswell had had the good

fortune, most likely by family influence, to be retained as a junior on the Douglas side—his retainer is duly entered in his Brief Book—and his zeal for his client soon showed itself in two directions. In five great quartos which dare tell of nothing else, the records of that *cause célèbre* now lies buried; but there is an octavo volume printed in 1767, entitled *The Essence of the Douglas Cause*, which stands at the credit of the young advocate—a monument of industry if nothing more. The immense labour of summarising the evidence, we may believe, was undertaken for the laudable purpose of obtaining professional advancement; the other volume, by the same pen, is more interesting, but more difficult to explain.

In July, 1767, as is well known, the Court of Session, by the casting vote of the Lord President, pronounced against Douglas. Six weeks earlier, however, advertisements in London and Edinburgh prints had announced a work with the title *Dorando, a Spanish Tale*. The book, which had a rapid sale, appeared on June 15th; a second edition came out five days later; a third on June 29th. No reader of that day could have had any doubt as to its meaning. As a contemporary critic in the *London Review* remarked—"The allusion is indeed so plain that to make Dorando the Douglas Cause nothing else is left to be done by the reader but to substitute Britain for Spain, Edinburgh for Seville, and London for Madrid. The persons are so marked by their characters that there is no difficulty in the application." Dashed off evidently in an access of enthusiasm—due to overzeal and indiscretion—the thinly veiled apologue, in the guise of a Spanish romance, might easily have brought its author to the bar for a grave contempt of court. As the booklet was published in London, the printers being outwith the jurisdiction of the Scottish Courts could not be prosecuted; but the proprietors of Edinburgh newspapers and magazines, less fortunate, merely for reviewing the work and giving extracts from it, were at the instance of the judges committed to the Tolbooth to find sureties; and later, solemnly arraigned and severely censured. A person reading the trial now, as one of the earliest reported cases touching the liberty of the press in Scotland, will miss the element of high comedy underlying it, unless he knows that James Boswell who appeared as Counsel for one of the accused, was himself, as the author of the work, far more truly the delinquent than his client in the dock. The farcical

situation, we may be sure, was enjoyed by Counsel and prisoner, both of whom knew the whole truth.

But it is time now to turn to the *Journal of a Tour in Corsica*, printed at the famous Foulis Press, and published by Dilly of London in the spring of 1768. It is an octavo of 382 pages, made up of two parts—a History of the Island (258 pages), and Boswell's Journal (124 pages), with a dedication to Pascal Paoli, and a preface. As a work of travel and adventure, it is difficult to name another quite like it. In 1768 it was a book of the season. It described an island which no Englishman had seen, and a brave people, fighting for liberty, in whom not a few Englishmen were interested. But it differed from its class, and in many ways called attention to itself. If not an original, it was at least an exemplar. In the *Journal* the author told what he heard and saw as no traveller before him had ever done. The book was received with applause; passed through many editions; obtained additional distinction by translation into several languages; and after some years was relegated to the upper shelf where it still remains. But though strangely neglected, it is not of the proletariat crowd. It is the work of an author who unites in himself some of the rarer qualities of Sterne and Goldsmith; we have only to read it to discover the indefinable subtle quality that confers immortality. The personal note that pervades it is charming; the style is singularly easy and graceful because always perfectly natural. At the outset the reader is assured: "I have found that I am able to accommodate myself to my fellow creatures of different languages and sentiments. I did not fear that it would be a difficult task for me to make myself easy with the plain and generous Corsicans." For servant he has "an honest Swiss who loved to eat and drink well."

To enliven the journey an element of comedy is introduced:—"Before I left Leghorn I could observe that my tour was looked upon by Italian politicians in a very serious light, as if truly I had a commission from my Court to negotiate a treaty with the Corsicans. The more I disclaimed any such thing, the more they persevered in affirming it; and I was considered as a very close young man. I therefore just allowed them to make a minister of me till time should undeceive them." It is the very plot of Scribe's delightful play *Le Diplomat*, and the young traveller, whom Wilkes curiously enough only a few weeks earlier had

advised to qualify for the diplomatic service, acts the part to the life.

Not far on in his tour he unwittingly assumes another part, reminiscent of Goldsmith's famous comedy:—"Before I was accustomed to the Corsican hospitality I sometimes forgot myself, and imagining I was in a public house, called for what I wanted, with a tone which one uses in calling to waiters at a tavern. I did so at Pino, asking for a variety of things at once: when Signora Tomasi, perceiving my mistake, looked in my face and smiled, saying with much calmness and good nature, 'Una cosa dopo un'altra, Signore'—One thing after another, Sir." Lodging sometimes in private houses, sometimes in convents, being always well recommended from place to place "I soon learnt to repair to my dormitory as naturally as if I had been a friar for seven years."

The book is full of incidents and passages that remain in the memory, such as the singing of the Ave Maria at sunset on the brig that carried him from Leghorn to the island, with this the simplest of reflections:—"It was pleasing to enter into the spirit of their religion and hear them offering up their evening orisons." On the first Sunday he goes with his host to hear mass in the parish church: the parish priest was to preach, "at which I was much pleased, being very curious to hear a Corsican sermon. Our priest did very well. His text was in the Psalms—'Descendunt ad infernum viventes. They go down alive into the pit.' After endeavouring to move our passions with a description of the horrors of hell, he told us 'Saint Catherine of Siena wished to be laid on the mouth of this dreadful pit, that she might stop it up so as no more unhappy souls should fall into it. I confess, my brethern, I have not the zeal of holy Saint Catherine. But I do what I can: I warn you how to avoid it.' He then gave us some good practical advices and concluded."

The gems of the *Journal*, as one would expect, are found in the causeries with Paoli, with whom he lived in closest intimacy, but selection would give but an imperfect notion of the intrinsic value and beauty of the collection; I prefer therefore to give as a last quotation a passage which for vivid realism and idyllic perfection will compare favourably with Sterne's classic story of the Dead Ass.

"The Corsican peasants and soldiers were quite free and easy with me. Numbers of them used to come and see me of a

morning, and just go out and in as they pleased. I did everything in my power to make them fond of the British, and bid them hope for an alliance with us. They asked me a thousand questions about my country, all which I cheerfully answered as well as I could.

"One day they would needs hear me play upon my German flute. To have told my honest natural visitants—'Really, gentlemen, I play very ill,' and put on such airs as we do in our genteel companies, would have been highly ridiculous. I therefore immediately complied with their request. I gave them one or two Italian airs, and then some of our beautiful old Scots tunes—*Gilderoy, The Lass of Patie's Mill, Corn Riggs* are bonny. The pathetic simplicity and pastoral gaiety of the Scots music will always please those who have the genuine feelings of nature. The Corsicans were charmed with the specimens I gave them, though I may now say they were very indifferently performed.

"My good friends insisted also to have an English song from me. I endeavoured to please them in this too, and was very lucky in that which occurred to me. I sung then 'Hearts of oak are our ships, Hearts of oak are our men.' I translated it into Italian for them, and never did I see men more delighted with a song than the Corsicans were with *Hearts of Oak*. 'Cüore di querco,' cried they, 'bravo Inglese.' It was quite a joyous riot. I fancied myself to be a recruiting sea officer. I fancied all my chorus of Corsicans aboard the British Fleet."

But it is time to leave illustrations and bring this paper to an end. An appreciation of Boswell is not to be thought of. To-night we have been considering his career at its opening—a mere fragment of the life. But in any just estimate of him, either as a man or an author, these early years must count. It was in that period he recognised in himself his decisive literary bent, and pursued it without hesitation. What Carlyle calls the "inner divine secret" of the man is far more clearly discernible in the minor works and in the letters to Temple than in the Biography, the book usually interrogated. That Boswell was foolish and wayward is as clear as the sun in the heavens; to say that he was a fool and a dunce, and that the Biography was struck off by chance, as many critics even now would have us believe, is only a proof of the foolishness of much that passes for criticism.

Boswell really had no secret. His minor works shew that Mon-

taigne was one of his favourite authors—"pouring myself out like old Montaigne" is a recurring phrase—and in that great master he would read that "The boldness of doing ill is in some sort compensated and restrained by the boldness of confessing it. . . . A man must see and study his vice to correct it ; and they who conceal it from others usually conceal it from themselves. . . . As in doing well, so in doing ill, the mere confession is sometimes satisfaction." No disciple ever learnt the lesson so well as James Boswell. His friend Temple was his confessor. "Between us two" he says in one of the letters, "all rules and all maxims are suspended." But to the world he confessed, time and again, all that was needed to be known about him. Could anything be more explicit, more dignified, than this passage from the Preface to the *Journal of a Tour in Corsica*?—"He who publishes a book, affecting not to be an author, and professing an indifference for literary fame, may possibly impose upon such people such an idea of his consequence as he wishes may be received. For my part, I should be proud to be known as an author, and I have an ardent ambition for literary fame ; for of all possessions I should imagine literary fame to be the most valuable. A man who has been able to furnish a book which has been approved by the world has established himself as a respectable character in distant society, without any danger of having that character lessened by the observation of his weakness. To preserve an uniform dignity among those who see us every day, is hardly possible ; and to aim at it, must put us under the fetters of a perpetual restraint. The author of an approved book may allow his natural disposition an easy play, and yet indulge the pride of superior genius when he considers that by those who know him only as an author, he never ceases to be respected. Such an author when in his hours of gloom and discontent, may have the consolation to think that his writings are at that very time giving pleasure to numbers : and such an author may cherish the hope of being remembered after death, which has been a great object to the noblest minds in all ages. Whether I may merit any portion of literary fame the public will judge. Whatever my ambition may be, I trust that my confidence is not too great, nor my hopes too sanguine." No digging into his mind will ever extract more than is disclosed by these words.

It is in those early days also that we see Boswell's preparation

for authorship. The April of his years, like Montaigne's, was "lusty, vigorous, full and idle;" but there was health in it too. His hours were not all mis-spent. "You have now lived," Johnson said to him in 1766, "five and twenty years, and you have employed them well." "Alas, Sir," said I, "I fear not. Do I know history? Do I know mathematics? Do I know law?" "Why, Sir, though you may know no science so well as to be able to teach it, and no profession so well as to be able to follow it, your general mass of knowledge of books and men renders you very capable to make yourself master of any science, or fit yourself for any profession." And Johnson was right. The letters to Temple and the minor works testify the same thing.

But what most arrests attention is the clear definite aim to excel in the field of biography. To Temple he unbosomed himself first, as always:—"I am absolutely certain that my mode of biography which gives not only a history of Johnson's visible progress through the world, and of his publications, but a view of his mind in his letters and conversation, is the most perfect that can be conceived, and will be more of a Life than any work that has yet appeared." And though by the Biography alone his star now shines high above the horizon, it should never be forgotten that it was habit and practice that sharpened his gifts, and made his life task possible.

RULES GOVERNING THE COMPETITION FOR THE
GRAHAM MEDAL.

1. The competition for the Graham Medal shall be under the authority and control of the Council of the Royal Philosophical Society of Glasgow, whose decision on all matters connected therewith shall be final.

2. Each candidate shall forward to the Secretary of the Royal Philosophical Society of Glasgow, 207 Bath Street, Glasgow, on or before 14th March of the year in which the competition is held, a paper giving an account of an unpublished original research conducted by himself in any branch of chemical science, pure or applied.

3. The award shall be made to the candidate whose research, in the opinion of the Council, or of the person or persons whom they may appoint to adjudicate in the matter, is of the highest merit, and most likely to aid in the advancement of chemical science.

4. The value of the award shall be £10, and, according to the wish of the successful candidate, may take the form of (i) the Graham Medal in gold; (ii) the Graham Medal in bronze, and scientific instruments or books; (iii) the Graham Medal in bronze, and the balance in money to be applied in chemical research.

5. The paper, on account of which the medal is awarded, shall be read before the Royal Philosophical Society of Glasgow, and shall thereafter be published in the *Proceedings* of the Society.

6. No award shall be made if, in the opinion of the Council, no paper of sufficient merit has been offered.

MINUTES OF SESSION.

1909-1910.

3rd November, 1909.

THE First Meeting of the Society, for Session 1909-1910, was held in the Rooms, 207 Bath Street, on Wednesday, 3rd November, 1909. In the absence of the President Professor J. Graham Kerr, Vice-President, occupied the Chair.

1. Mr Frederick Soddy, M.A., Lecturer on Physical Chemistry, Glasgow University, delivered a lecture under the auspices of the Graham Lecture Trust, entitled "Some Recent Investigations in the Physical Chemistry Laboratory of the University of Glasgow." Experiments were made and lantern slides shown in illustration of the lecture. Among the speakers in the subsequent discussion were Mr H. A. Mavor, Dr R. F. Muirhead, Mr Alex. L. Boston, Mr D. J. Playfair, and the Chairman. Mr Soddy replied and was accorded the thanks of the Meeting.

2. The Chairman announced that the following gentlemen had been unanimously elected to Membership of the Society :—

1. Mr HERBERT BONHAM, Woodlands, Thornliebank. Recommended by Mr William Kerr, Dr Freeland Fergus, and Professor Bennett.
2. Mr GEORGE BRANDER, Depute-Procurator Fiscal, 14 Kelvinside Gardens. Recommended by Mr Thomas Machell, Dr Freeland Fergus, and Dr Geo. Neilson.
3. Mr THOMAS T. M. DISHINGTON, M.B., Ch.B., Ranfurly Lodge, Bridge-of-Weir. Recommended by Dr J. C. Edmiston, Dr Freeland Fergus, and Mr H. F. Stockdale.

4. Mr GEORGE DONALD, M.A., c/o Macdonald, 6 Windsor Street, Glasgow. Recommended by Mr John Donald, Mr Chas. R. Gibson, and Prof. Bennett.
5. Mr H. P. FAIRLIE, M.B., Ch.B., 402 Sauchiehall Street. Recommended by Dr J. C. Edmiston, Dr Freeland Fergus, and Principal M'Lean.
6. Mr GORDON THOMSON FREW, 216 West George Street. Recommended by Mr Alexander Frew, Dr Geo. Neilson, and Mr John S. Samuel.
7. Mr WILLIAM H. HOWIE, Dunrye, Potterhill, Paisley. Recommended by Mr T. D. Robb, Mr Chas. R. Gibson, and Mr John Clark.
8. Mr J. P. KINGHORN, The Anchorage, Burnside. Recommended by Mr C. H. Roemmele, Dr Freeland Fergus, and Mr John S. Samuel.
9. Mr ALEXANDER LANGLANDS, 32 Huntly Gardens, Glasgow. Recommended by Professor M'Kendrick, Dr Freeland Fergus, and Dr J. Souttar M'Kendrick.
10. Captain H. G. LYONS, F.R.S., 34 Huntly Gardens. Recommended by Professor J. W. Gregory, Mr William Ewing, and Professor J. Graham Kerr.
11. Mr JAMES MOODIE, M.A., F.E.I.S., Headmaster, Petershill Public School. Recommended by Mr William Tait, Dr Geo. Neilson, and Professor Bennett.
12. Mr HOWARD HENDERSON PATRICK, M.B., Ch.B., 7 Belmont Street, Glasgow. Recommended by Dr J. C. Edmiston, Dr Freeland Fergus, and Professor Henderson.
13. Mr T. S. PATTERSON, Ph.D., D.Sc., 8 Glasgow Street, Glasgow, W. Recommended by Mr T. L. Patterson, Professor John Ferguson, and Professor J. Graham Kerr.
14. Mr DAVID PERRY, Provost of Kirkintilloch, Norwood, Lenzie. Recommended by Mr John S. Samuel, Dr Freeland Fergus, and Mr Chas. R. Gibson.
15. Mr JOHN ROGERS, c/o Nobels Explosives Co., Ltd., 195 West George Street. Recommended by Professor G. G. Henderson, Professor Magnus Maclean, and Professor Thomas Gray.
16. Mr JOSEPH C. ROMBACH, 18 Barfillan Drive, Craigton, Glasgow. Recommended by Mr Alex. B. Dobbie, Dr Freeland Fergus, and Mr H. F. Stockdale.
17. Mr CHARLES RUSSELL, Lochbrae, Bearsden. Recommended by Mr C. H. Roemmele, Dr Freeland Fergus, and Mr John S. Samuel.
18. Mr J. DOUGLAS TATLOCK, 13 Parkgrove Terrace, Glasgow, W. Recommended by Mr Chas. R. Gibson, Dr Freeland Fergus, and Dr Geo. Neilson.

REPORT OF COUNCIL FOR SESSION 1908-1909.

I. *Meetings of the Society.*—Session 1908-1909 was opened on 4th November, 1908, with an address by the President, Dr Freeland Fergus, on "The Present Position and Prospects of the Royal Philosophical Society." The address is printed in Vol. xl. of the *Proceedings*. Twelve meetings of the Society were held during the Session, and sixteen communications made, of which nine were illustrated by experiments, or by the projection lantern.

II. *The Sections of the Society.*—The work of the Sections was well abreast of that of the previous Session, both in purely sectional work, and in providing papers for meetings of the Society. Of the sixteen papers referred to above nine were contributions from the Sections. In addition to these there were twenty-eight papers and demonstrations put before meetings of Sections, making in all forty-four communications at which Members of the Society were entitled to be present.

The following information is supplied by the Reports of the Councils of the different Sections ;—

The Historical and Philological Section issued early in the Session a Syllabus for meetings at which papers were read on 'The Sources of the Hamlet Tragedy,' 'Gleanings in the Scots Vernacular,' 'Macbeth: a Character Study,' 'The Debt of English to Classical Literature,' 'Some Notes on the Early History of Rhyme,' 'A Notable Ecclesiastical Trial in the Fourteenth Century,' 'The Progress of Comedy in the Seventeenth Century,' and 'An Old Ayrshire Village in the Forties.' Two of these papers were read before the Society, and one is printed in the *Proceedings*.

Six papers and demonstrations were discussed by the Biological Section.

Members of the Mathematical and Physical Section made three communications to Meetings of the Society. One Sectional Meeting was held at which two papers containing the results of original research were read. Both are printed in the *Proceedings*.

The Sanitary and Social Economy Section contributed two papers to Meetings of the Society :—"The Laws of Individual Growth" and "The Physique of Glasgow Children," which are printed in the *Proceedings*.

There were seven Meetings of the Architectural Section held during the Session for the hearing and discussion of papers.

The average attendance was 38.

The following were the Subjects of the Papers :—"The Study of Mediæval Architecture," "Some points in dispute connected with House Drainage and Sewage Treatment," "The Chateaux of France," "Ferro-Concrete Construction as applied to Buildings," "Architectural Education, a Retrospect and Forecast," "The Building Stones of the Glasgow District," "Asylum Construction."

The Economic Science Section held 6 Ordinary Meetings during the session at which the attendance was between one hundred and two hundred and fifty.

The papers read dealt with subjects of present-day Economic and Social interest, viz. :—"Poor Relief," "Unemployment Insurance," "Railway Economics," "Co-operative Farming," "Municipal Taxation," "Labour Exchange and Colonies," and "The Report of the Royal Commission on the Poor Law." The Papers contributed by Mr James Muirhead and Professor Lodge were read at Meetings of the Society as communications from the Section. One of the papers appears in the *Proceedings*.

The number of Associates at date is 84, the number of new Associates admitted during the Session being 17.

III. *The Proceedings*.—Volume xl. of the *Proceedings* containing the transactions of the Society for Session 1908-1909 will be issued to Members shortly. In addition to minutes, lists of periodicals, the roll of Members, and the like, it will include fifteen papers; 12 of which were read before the Society and three before the Sections. Six of the twelve, however, were communications to the Society from the Sections, so that 9 of the fifteen printed papers were contributed by one or other of the Sections.

IV. *Representatives of the Society*.—Dr Freeland Fergus continues to serve on the Board of Governors of the Technical College, and Dr John Brownlee on the Executive Committee of the Millport Marine Biological Association. Mr Gilbert Thomson was appointed to attend the Public Health Congress at Leeds, and Professor J. Graham Kerr to attend a meeting of Delegates of Corresponding Societies of the British Association.

An invitation to the Society from the University of Cambridge to take part in the celebrations to be held at Cambridge, in commemoration of the centenary of the birth of Charles Darwin was accepted, and Professor J. Graham Kerr, appointed Delegate. On behalf of the Society an address to the University of Cambridge, appropriate to the occasion, was prepared by the Council and presented by Professor Graham Kerr.

V. *Graham Medal*.—The Graham Medal was duly advertised, but no award was made.

VI. *Membership*.—During the Session 24 Members were elected, 36 have resigned, 2 have been struck off the roll for non-payment of their subscriptions and 14 have died. The following is a list of names of deceased Members :—Dr James Whitson, Alex. Brown, Robert Millar, John W. Yuille, R. W. Mackinlay, Robert Gow, W. C. Bergius, Jas. D. G. Dalrymple, Wm. Graham, Dr Robert Pollok, George Robb, Anderson Rodger, Dr Neil Carmichael, and Alex. Lamberton. Four of these were Life Members. During the Session four of the new Members qualified as Life Members. The Roll now includes 14 Honorary Members, 16 Corresponding Members and 887 Ordinary Members (Life and Annual), or a total of 917.

VII. *Finance*.—The Honorary Treasurer's statement for Session 1908-1909 shows the ordinary revenue to amount to £696 13s 4d, and the ordinary expenditure to £801 4s 2d, being an excess of ordinary expenditure over revenue of £104 10s 10d, as against a surplus in the previous session of £56 6s 4d. This change is due mainly to the loss of rental upon the removal of the Society of Engineers & Shipbuilders to their own premises. After applying

the Entry-money and Life Membership subscriptions received during the year, £80 17s., the deficit for the past session is reduced to £23 13s 10d.

The capital of the Society at 30th September, 1909, as shown in the Balance Sheet amounts to £5326 19s 3d, irrespective of the value of the library. As formerly, separate statements are given by the Honorary Treasurer showing the position of the two funds which the Society holds in Trust, viz. :—"The Graham Medal Fund," and "The Science Lectures Association Fund," the accumulations of revenue at 30th September, 1909, being £139 14s 7d, and £14 15s 10d respectively.

PETER BENNETT, *Secretary.*

REPORT OF THE LIBRARY COMMITTEE.

The chief work of the year in connection with the Library has been the re-classification of the books on the international scheme, according to subjects, an arrangement which will prove to be of the greatest convenience alike to readers and the librarians themselves. The first stage of this great work is already accomplished, and the second is well advanced, so that by the end of the present Session 1909-10, the final revision ought to be completed. Three well-known scientific series, the International, Contemporary, and Progressive Science Series, have been exempted from the general scheme, and retained as complete series, but complete lists of these will be exhibited for the use of readers. Sociology is still the division most in demand, and every effort is being made to keep this section thoroughly abreast of the times. History and Biography form a good second in the choice of readers, and in these departments the Library is now fairly strong. During the Session '74 volumes were added to the Library, and a full list of these, as well as of the 192 exchanges with other Societies, will be found in vol. xl. of the *Proceedings*. For the convenience of Members the following outline is given of the scheme of classification now being followed :—

- | | |
|------------------|--------------------------------|
| 0. Bibliography. | 6. Applied Science. |
| 1. Philosophy. | 7. Fine Arts. |
| 2. Theology. | 8. Literature. |
| 3. Sociology. | 9. History and Geography. |
| 4. Philology. | 92. Biography, in alphabetical |
| 5. Science. | order of subjects. |

The sub-divisions of Section 5, Natural Science, to which most of the books belong, fall under the following numbers :—

- | | |
|------------------|--------------------|
| 51. Mathematics. | 56. Palaeontology. |
| 52. Astronomy. | 57. Biology. |
| 53. Physics. | 58. Botany. |
| 54. Chemistry. | 59. Zoology. |
| 55. Geology. | |

The scheme of classification extends to the third and sometimes to the fourth figure ; thus 339 refers to Pauperism, 537 to Electricity, 9415 to Irish History, etc.

JAMES KNIGHT, *Convener.*

17th November, 1909.

THE Second Meeting of the Society, for Session 1909-1910, was held in the Rooms, 207 Bath Street, on Wednesday, 17th November, 1909. The President, Dr Freeland Fergus, occupied the Chair.

1. The Minute of Meeting of date 3rd November was approved, and was thereupon signed by the Chairman.

2. The new Members elected at the previous Meeting were duly admitted.

3. The Abstracts of Accounts, signed by the Auditors, Mr W. R. Copland and Mr D. M'Kechie, and the Annual Reports of the Council and of the Library Committee were adopted on the motion of the Chairman. In connection with the Accounts the Chairman intimated that the Hon. Treasurer, Mr John Mann, had after forty-two years service laid down his office. The Council had accepted his resignation with extreme regret, and had appointed as his successor Mr John Mann, jun., so that the Society could rely upon a continuance of the same expert service that had been at their disposal for so long a period. Votes of thanks were passed to the Auditors and to the Donors of books.

4. Mr Alexander D. Ross, M.A., B.Sc., F.R.S.E., delivered a lecture, illustrated by experiments and lantern slides, entitled "The Evolution of the Telescope: an Address on the Ter-Centenary of its Invention," being a communication from the Mathematical and Physical Section. Dr Muirhead and the Chairman made appreciative remarks on the lecture, and Mr Ross received the thanks of the Meeting.

5. The following were elected to Membership of the Society :—

1. Mr JOHN CUTHBERTSON, M.A., F.E.I.S., 97 Greenhead Street, Glasgow.
Recommended by Dr James Knight, Dr Freeland Fergus, and Mr John S. Samuel.

2. Mr JAMES DEWAR, M.A., F.E.I.S., Headmaster, Chryston Public School, Schoolhouse, Chryston. Recommended by Mr Wm. G. K. Donaldson, Dr Geo. Neilson, and Professor Bennett.
3. Mr WILLIAM H. S. FARQUHARSON, M.A.(Glasg.), B.Sc.(Lond.), 58 Wardlaw Avenue, Rutherglen. Recommended by Mr Alexander Anderson, Dr Geo. Neilson, and Professor Thomas Gray.
4. Mr WILLIAM M'GREGOR, 30 Sutherland Terrace. Recommended by Mr John Harrison, Professor J. Graham Kerr, and Mr C. H. Roemmele.
5. Colonel Sir FREDERIC NATHAN, Nobel House, Stevenston, Ayrshire. Recommended by Mr C. O. Lundholm, Dr Freeland Fergus, and Professor G. G. Henderson.
6. Mr JAMES WILSON NEILSON, Writer, 198 West George Street. Recommended by Mr Alexander Blair, Mr Fred G. MacKillop, and Mr J. V. Stevenson.
7. Mr ALEXANDER D. ROSS, M.A., B.Sc., F.R.S.E., Natural Philosophy Department, Glasgow University. Recommended by Professor Andrew Gray, Professor James Muir, and Mr Chas. R. Gibson.
8. Dr ANDREW WILSON, 1 Newton Terrace, Glasgow. Recommended by Dr Freeland Fergus, Dr Oswald Fergus, and Professor Bennett.

[ABSTRACTS.]

AND COMPARISON WITH

NET of Ordinary Revenue (1988-89), etc.

EXPENDITURE—SESSION 1908-1909.

SESSION 1907-1908.

ORDINARY EXPENDITURE.		1908-1909.	1907-1908.
		£ S. D.	£ S. D.
ADMINISTRATION EXPENSES—			
Remuneration to Secretary, - - -	£100 0 0		
Allowance for Treasurer's Clerks, - -	15 0 0		
Commission to Collectors, - - -	3 5 8		
Telephones, - - - - -	7 18 6		
Stationery, - - - - -	5 10 10		
Fire Insurance on Library, - - -	6 10 0		
Postages and Sundry Charges, - - -	34 4 2		
		172 9 2	163 12 1
EXPENSES OF ROOMS—			
Upkeep and Service for year, £258 11 0			
Interest on Bond, - - -	108 1 4		
	£366 12 4		
Deduct—Rents received from other Societies, 81 12 6			
		284 19 10	65 19 5
LIBRARY—			
New Books and Periodicals, British and Foreign, Bookbinding, - - -	£118 6 4		
Subscriptions to Societies, - - -	2 18 6		
		121 4 10	180 8 11
PRINTING—			
Printing and Postage of <i>Proceedings</i> , Circulars, etc., -		199 0 5	206 15 9
EXPENSES OF SECTIONS PER SECRETARIES—			
Architectural, - - - - -	£10 4 5		
Economic Science, - - - - -	10 9 01		
Historical and Philological, - - -	2 0 4		
Mathematical and Physical, - - -	0 2 0		
		23 9 11	19 2 11
EXCESS OF ORDINARY REVENUE over Ordinary			
Expenditure carried down (1907-08), - - -		...	56 6 4
		£801 4 2	£692 5 5
EXTRAORDINARY EXPENDITURE.			
DEFICIENCY of Ordinary Revenue, brought down (1908-09),		£104 10 10	...
SURPLUS carried to Capital Account (1907-08), - - -		...	£130 17 4
		£104 10 10	£130 17 4

Royal Philosophical Society of Glasgow.

BALANCE SHEET, AS AT 30TH SEPTEMBER, 1909.

LIABILITIES.		ASSETS.	
BOND—		BUILDINGS—	
Over Buildings at 3½%,	£3250 0 0	207 Bath Street—Buildings and Furnishings, per last Account,	£7933 7 4
ACCRUED CHARGES—		LIBRARY—	
Interest, Rates, etc.,	62 11 5	Not valued,	0 0 0
CAPITAL—		INVESTMENTS—	
At 30th September, 1908,	£5350 13 1	£440 Caledonian Railway Co. 4 per cent. Debenture Stock (present value £502 14s.),	£492 7 4
Deduct Deficit on Revenue Account, 1908-09,	23 13 10	Glasgow Corporation Temporary Loan, 200 0 0	692 7 4
		CASH—	
		In Bank and in Hon. Treasurer's hands,	13 16 0
			<u>£8639 10 8</u>

GLASGOW, 29th October, 1909.—As Auditors appointed by the Society to examine the Honorary Treasurer's Accounts for Session 1908-1909, we have examined the same along with above abstracts, and have found the whole correct.

JNO. MANN, C.A., *Honorary Treasurer,*

D. M'KECHNIE,
W. R. COPLAND, } *Auditors,*

THE SCIENCE LECTURES ASSOCIATION FUND.

Dr. ABSTRACT OF TREASURER'S ACCOUNT—Session 1908-1909. Cr.

CAPITAL AT 30th SEPTEMBER, 1908, . . .	£252 10 0	INVESTMENTS—	
REVENUE ACCUMULATIONS TO 30th		£200 Caledonian Railway Company	
SEPTEMBER, 1908, . . .	£6 18 0	4 Per Cent. Preference Stock, in	
REVENUE FOR YEAR 1908-1909—		name of the Philosophical Society, in	
Dividends from Caledonian		trust (present value, £211 15s), .	£244 4 8
Railway Co., . . .	£7 11 7	In Bank, on Deposit Receipt, .	8 5 4
Interest from Bank, . . .	0 6 3	In Bank, on Deposit Receipt, being Accumulated	£252 10 0
		Revenue, per <i>contra</i> , . . .	14 15 10
			<u>£267 5 10</u>

GLASGOW, 29th October, 1909. —Examined and found correct.

JNO. MANN, C.A., *Honorary Treasurer*,

D. M'KECHNIE,
W. R. COPLAND, } *Auditors*.

GRAHAM MEDAL AND LECTURE FUND.

Dr. ABSTRACT OF TREASURER'S ACCOUNT, SESSION 1908-1909. Cr.

CAPITAL AT 30th SEPTEMBER, 1908,	-	£268 18 0	INVESTMENTS—	
REVENUE ACCUMULATIONS TO 30th			£250 Glasgow and South-Western	
SEPTEMBER, 1908,	-	£127 1 10	Railway Co., 4% Preference Stock in	
REVENUE FOR YEAR 1908-1909—			name of the Philosophical Society, in	
Dividends from G. & S. W.	-	£9 9 6	trust (present value of £262 10s),	£250 0 0
Railway Co.,	-		Value of Die at H.M. Mint,	18 18 0
Dividends from Caledonian	-			£268 18 0
Railway Co.,	-	3 8 5		
Interest from Bank	-	0 8 10		
			REVENUE ACCUMULATIONS, per contra—	
Less Expenditure—Adver-	£13 6 9		£ 90 Caledonian Railway 4% Deb:	
tising in "Nature,"	- 0 14 0		Stock (present value £102 16s)	£100 14 2
			Bank on Deposit Receipt,	39 0 5
		12 12 9		139 14 7
				£408 12 7

GLASGOW, 29th October, 1909.—Examined and found correct.

D. M'KECHNIE, } Auditors.
W. R. COPLAND, }

JNO. MANN, C.A., *Honorary Treasurer*

1st December, 1909.

THE Third Meeting of the Society, for Session 1909-1910, was held in the Rooms, 207 Bath Street, on Wednesday, 1st December, 1909. The President, Dr Freeland Fergus, occupied the Chair.

The Chairman referred to the death of Mr Thomas S. Cree, LL.D., who had been for forty years a Member of the Society.

1. The Minute of Meeting of date 17th November was approved, and was thereupon signed by the Chairman.

2. The new Members elected at the previous Meeting were duly admitted.

3. Dr John Carswell read a paper entitled "The Legal Control of Inebriates." A discussion followed in which part was taken by Dr Eben. Duncan, Ex-Bailie D. M. Stevenson, Mr J. V. Stevenson, Mr Brander, Rev. Mr Alexander, Dr Snodgrass, and the Chairman. Dr Carswell replied and received the thanks of the Meeting.

4. The following were elected to Membership of the Society:—

1. Mr ADAM GILLISON BROWN, 18 Royal Terrace, Glasgow, W. Recommended by Mr Wm. C. Coghill, Mr Chas. R. Gibson, and Professor Thomas Gray.
2. Mr WALTER BUCHANAN, Secretary, Clyde Ironworks, Dunclotha, Tollcross. Recommended by Dr Alexander Scott, Dr George Neilson, and Professor Bennett.
3. Mr DONALD C. FLETCHER, 37 Kelvinside Gardens. Recommended by Mr C. H. Roemmele, Mr John S. Samuel, and Professor G. G. Henderson.
4. Mr GEO. A. GIBSON, M.A., LL.D., F.R.S.E., Professor of Mathematics in the University of Glasgow. Recommended by Dr Freeland Fergus, Professor Andrew Gray, and Mr H. F. Stockdale
5. Mr J. H. GOUDIE, 25 Miller Road, Ayr. Recommended by Dr Freeland Fergus, Dr Oswald Fergus, and Professor Bennett.
6. Mr JAMES G. GRAY, D.Sc., Lecturer on Physics in the University of Glasgow. Recommended by Professor Andrew Gray, Dr Freeland Fergus, and Mr Alexander D. Ross.
7. Mr WALTER MACLEAN, 4 Clairmont Gardens. Recommended by Mr Wm. C. Coghill, Dr Oswald Fergus, and Professor Bennett.

12th January, 1910.

THE Fifth Meeting of the Society, for Session 1909-1910, was held in the Rooms, 207 Bath Street, on Wednesday, 12th January, 1910. The President, Dr Freeland Fergus, occupied the Chair.

1. The Minute of Meeting of date 15th December, 1909, was approved, and was thereupon signed by the Chairman.

2. The new Members elected at the previous Meeting were duly admitted.

3. Mr Adam A. Rankin read a paper, illustrated by diagrams and lantern views, on "Recent Advances in Cometary Investigation," being a communication from the Mathematical and Physical Section. A discussion followed in which part was taken by Dr James Knight, Dr James G. Gray, Dr Sloan, Mr Alex. D. Ross, Mr Chas. R. Gibson, the Chairman and Mr Rankin. Mr Rankin was accorded a vote of thanks.

4. The following were elected to Membership :—

1. Mr HUGH CRAWFORD CAMERON, Teacher, 21 Kelvingrove Street, Glasgow. Recommended by Mr D. Macgillivray, Dr Geo. Neilson, and Professor Peter Bennett.
2. Mr JOHN FLEMING, 1 Lynedoch Terrace, Glasgow. Recommended by Mr C. H. Roemmele, Mr John S. Samuel, and Mr Chas. R. Gibson.
3. Mr EDWARD G. HAWKE, B.A.(Oxon. and Lond.), 3 North Park Terrace. Recommended by Professor J. W. Gregory, Professor J. Graham Kerr, and Captain H. G. Lyons.
4. Mr ARTHUR MECHAN, M.B., Ch.B., 12 Victoria Crescent. Recommended by Dr Freeland Fergus, Dr Oswald Fergus, and Dr Geo. Neilson.

26th January, 1910.

[THE business of the Sixth Meeting was postponed by order of the Council.]

9th February, 1910.

THE Seventh Meeting of the Society, for Session 1909-1910, was held in the Rooms, 207 Bath Street, on Wednesday, 9th February,

1910. In the absence of the President Professor J. Graham Kerr, Vice-President, occupied the Chair.

1. The Minute of Meeting of date 12th January was approved, and was thereupon signed by the Chairman.

2. Mr Charles M'Donald, Chief Inspector, Weights and Measures Department, Glasgow, read a paper entitled "The Metric System of Weights and Measures: Some Practical Considerations regarding its Proposed Adoption in the United Kingdom." A discussion followed in which part was taken by the Chairman, Captain Lyons, Mr Lindsay Galloway, Mr Finlayson, Mr Bromhead, Mr Mackillop, Dr Geo. Neilson, Dr Muirhead and Mr Erskine Muirhead. A vote of thanks was passed to Mr M'Donald on the motion of the Chairman.

3. Dr Walter H. Kiep, Lismore House, Kelvinside N., Glasgow, was elected to Membership of the Society.

23rd February, 1910.

THE Eighth Meeting of the Society, for Session 1909-1910, was held in the Physical Laboratories of the University of Glasgow, on Wednesday, 23rd February, 1910. By kind permission of Professor Andrew Gray all the rooms of the Natural Philosophy Institute were thrown open, and the apparatus, historical and modern, arranged for the inspection of Members. Under the supervision of Dr James G. Gray and Mr Alex. D. Ross, M.A., B.Sc., a series of demonstrations in various branches of Physics were made in the different laboratories by research scholars and students of the department. The liquid air plant was also shown in operation. Shortly after nine o'clock the Members met in the Lecture Theatre of the Institute. In the absence of the President Dr Geo. Neilson, Vice-President, occupied the Chair. Professor Andrew Gray conveyed to the Meeting the welcome of the Senate of the University. A lecture on "Hertzian Waves and Wireless Telegraphy" was delivered by Dr Gray, and Mr Ross followed with a lecture on "Liquid Carbonic Acid and Liquid Air." Both lectures were fully illustrated by experiments and diagrams.

On the motion of the Chairman votes of thanks were accorded to the Senate, to Professor Gray, and also to Dr Gray, Mr Ross and the Scholars and Students who had assisted them.

9th March, 1910.

THE Ninth Meeting of the Society, for Session 1909-1910, was held in the Rooms, 207 Bath Street, on Wednesday, 9th March, 1910. The President, Dr Freeland Fergus, occupied the Chair.

1. The Minutes of Meetings 9th and 23rd February were approved, and were thereupon signed by the Chairman.

2. Dr Walter H. Kiep was duly admitted to Membership.

3. Professor John Ferguson, LL.D., read a paper entitled "Notes on the History of Chemistry in France in the Seventeenth Century," No. I., and was accorded the thanks of the Meeting.

4. Mr J. T. T. Brown read a paper on "The Youth and Early Manhood of James Boswell," being Mr Brown's Presidential Address to the Historical and Philological Section. Mr Tod Ritchie and Dr Fergus made appreciative remarks on the paper and a vote of thanks was passed to Mr Brown.

5. The Chairman announced that the following gentlemen had been elected Members of the Society :—

1. Mr THOMAS O. DAVIES, 35 Stockwell Street. Recommended by Mr Charles MacDonald, Dr Geo. Neilson, and Mr C. H. Roemmele.
 2. Mr JAMES A. M'CALLUM, M.A., LL.B., 194 Ingram Street, Glasgow. Recommended by Mr John J. Coats, Dr Freeland Fergus, and Dr Geo. Neilson.
 3. Mr JOHN S. POOLEY, Eblana, Glenburn Road, West, Bearsden. Recommended by Mr Charles MacDonald, Dr Geo. Neilson, and Professor Bennett.
-

23rd March, 1910.

THE Tenth Meeting of the Society, for Session 1909-1910, was held in the Rooms, 207 Bath Street, on Wednesday, 23rd March,

1910. The President, Dr Freeland Fergus, occupied the Chair.

1. The Minute of Meeting of date 9th March was approved, and was thereupon signed by the Chairman.

2. The new Members elected at the previous Meeting were duly admitted.

3. Dr J. W. Slaughter, Chairman of the Council of the London Eugenic Association, read a paper entitled "The Possibilities of Race Improvement." Speakers in the discussion which followed were Dr A. K. Chalmers, Mr Wm Buchanan, Dr John Brownlee, Mr Erskine Muirhead, Mr M'Kendrick, Dr Beath Henderson and the Chairman. Dr Slaughter replied, and was accorded a vote of thanks.

4. Mr Claud A. Allan, Kilmahew, Cardross, Dumbartonshire, recommended by Mr Chas. R. Gibson, Mr R. G. Service, and Mr W. Service, was duly elected to Membership of the Society.

6th April, 1910.

THE Eleventh Meeting of the Society, for Session 1909-1910, was held in the Rooms, 207 Bath Street, on Wednesday 6th April, 1910. In the absence of the President Professor J. Graham Kerr, Vice-President, occupied the Chair.

1. The Minute of Meeting of 23rd March was approved, and was thereupon signed by the Chairman.

2. The new Member elected at the previous Meeting was admitted *in absentia*.

3. Professor G. Elliot Smith, M.A., M.D., F.R.S., University of Manchester, delivered a lecture, illustrated by the projection lantern, on "The History of Mummification in Egypt." Remarks on the subject of the lecture were afterwards made by Sir Donald M'Alister, Professor Thomas Bryce, Dr Geo. Neilson, Mr P.

Falconer, and the Chairman. A vote of thanks was passed to the Lecturer.

20th April, 1910.

THE Twelfth Meeting of the Society, for Session 1909-1910, was held in the Rooms, 207 Bath Street, on Wednesday, 20th April, 1910. The President, Dr Freeland Fergus, occupied the Chair.

1. The Minute of Meeting of date 6th April was approved, and was thereupon signed by the Chairman.

2. The following gentlemen were unanimously elected to fill the offices named, under the conditions stated in the Articles of Association:—President, Professor John Glaister, M.D.; Vice-President, Sir William Bilsland, Bart., LL.D.; Members of Council, Dr A. K. Chalmers, Mr John Clark, M.A., Mr C. H. Roemmele, and Mr T. Lindsay Galloway, C.E.; Hon. Librarian, Dr James Knight; Hon. Treasurer, Mr John Mann, Jun., M.A., C.A.; Auditors, Mr Alex. L. Boston, and Mr Charles Kirkwood.

3. Mr F. W. Hirst, Editor of "The Economist," delivered a lecture on "The Capture and Destruction of Commerce at Sea." A discussion followed in which part was taken by Dr David Murray, Mr D. M. Stevenson, Mr Mitchell, Mr John S. Samuel, Mr Martin, Bailie Bruce Murray and Dr Duff. Mr Hirst replied, and was accorded the thanks of the Meeting on the motion of the Chairman.

4. The following gentlemen were duly elected to Membership of the Society:—

1. Mr JOHN A. AIRD, Highfield, Mansewood, by Pollokshaws. Recommended by Mr Chas. R. Gibson, Prof. James Muir and Dr Freeland Fergus.
2. Mr A. HARVIE ANDERSON, Cotton Manufacturer, 18 Park Circus, Glasgow. Recommended by Mr Chas. R. Gibson, Mr C. H. Roemmele and Mr J. T. T. Brown.
3. Mr ALFRED CAMPION, Technical College, Glasgow. Recommended by Mr Chas. R. Gibson, Prof. Mellanby and Mr H. F. Stockdale.

4. Mr CHARLES D. CREE, 21 Exchange Square. Recommended by Mr Chas. R. Gibson, Prof. J. W. Gregory and Dr Wm Snodgrass.
5. Mr JOHN DAVIDSON, Auldfield, Pollokshaws. Recommended by Mr Chas. R. Gibson, Prof. J. W. Gregory and Mr C. H. Roemmele.
6. Mr CECIL H. DESCH, D.Sc., Ph.D., 9 Spring Gardens, N. Kelvinside. Recommended by Mr Chas. R. Gibson, Mr Frederick Soddy and Mr Alex. D. Ross.
7. Mr JOHN S. GALBRAITH, B.L., J.P., Solicitor, 30 Renfield Street, Glasgow. Recommended by Mr Chas. R. Gibson, Prof. J. W. Gregory and Mr C. H. Roemmele.
8. Mr W. B. GILFILLAN, 30 Hamilton Park Terrace. Recommended by Mr Chas. R. Gibson, Dr Wm Snodgrass and Mr C. H. Roemmele.
9. Mr JOHN H. HECK, Lloyd's Register, 342 Argyle Street, Glasgow. Recommended by Mr Chas. R. Gibson, Prof. J. W. Gregory and Mr C. H. Roemmele.
10. Mr CHARLES R. B. KIRKWOOD, 3 Westbourne Gardens, Glasgow, W. Recommended by Mr J. T. T. Brown, Mr Chas. R. Gibson and Prof. J. W. Gregory.
11. Mr GEO. LANG, The Wern, Mansewood, by Pollokshaws. Recommended by Mr Chas. R. Gibson, Prof. J. W. Gregory and Dr Wm Snodgrass.
12. Mr ROBERT LANG, Warrington, Moss Road, Pollokshields. Recommended by Mr Chas. R. Gibson, Prof. J. W. Gregory and Prof. John Ferguson.
13. Mr J. C. LAUDER, R.W.S., Art Club, Glasgow. Recommended by Dr Freeland Fergus, Dr Oswald Fergus and Prof. Bennett.
14. Mr JOHN N. McCUNN, American Consul, Homeview, Mansewood, by Pollokshaws. Recommended by Mr Chas. R. Gibson, Prof. James Muir and Dr Freeland Fergus.
15. Mr W. FERGUSON MACKENZIE, M.B., Ch.B., L.D.S., 25 Buckingham Terrace, Hillhead. Recommended by Dr J. B. Mackenzie Anderson, Mr Wm Foster and Dr J. Douglas Brownlee.
16. Mr CHARLES A. MACKINLAY, 5 Belhaven Crescent. Recommended by Mr Chas. R. Gibson, Prof. J. W. Gregory and Mr C. H. Roemmele.
17. Professor JOHN MILLER, M.A., D.Sc., 2 Northbank Terrace, Kelvinside, N. Recommended by Mr Chas. R. Gibson, Prof. James Muir and Prof. G. G. Henderson.
18. Dr JOHN M. MUNKO KERR, 7 Clairmont Gardens. Recommended by Mr Chas. R. Gibson, Dr Wm Snodgrass and Mr J. T. T. Brown.
19. Mr J. A. RUDD, 2 Northpark Terrace, Hillhead. Recommended by Mr Chas. R. Gibson, Mr J. T. T. Brown and Prof. J. W. Gregory.

20. Mr ROBERT WILSON, J.P., Dalsalloch, 18 Aytoun Road, Pollokshields.
Recommended by Mr Chas. R. Gibson, Mr Andrew Smith and Mr J. T. T. Brown.
21. Mr W. M. WILSON, 12 Bothwell Terrace, Hillhead. Recommended by
Mr Chas. R. Gibson, Dr Wm Snodgrass and Mr J. T. T. Brown.

5. On the motion of Professor J. Graham Kerr seconded by Mr Chas. R. Gibson, Dr Freeland Fergus, the retiring President, was accorded a hearty vote of thanks for his attention to the duties of the Chair and the valuable services he rendered to the Society during his term of office. Dr Fergus suitably replied.

6. The foregoing minute was read to the Meeting and approved, and the Chairman was authorized to sign it when it should be engrossed in the Minute-Book.

OFFICE-BEARERS
OF THE
Royal Philosophical Society of Glasgow.

SESSION 1909-1910.

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* FREELAND FERGUS, M.D., F.R.S.E., F.F.P.S.G.

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Prof. J. W. GREGORY, Sc.D., F.R.S.	JOHN S. SAMUEL, F.R.S.E.

* Retire by rotation in April, 1910.

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a Retire by rotation in 1910.

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THOMAS M'ARLY.

ROBERT FULLERTON, M.D.

J. ROBERTSON BLACKIE.

L. R. OSWALD, M.B.

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H. A. MAVOR, M.Inst. C.E.

CHARLES R. GIBSON.

J. G. KERR, LL.D.

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JOHN EDWARDS, }

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I. C. EWING.

D. F. PERCY, M.A.

W. F. RITCHIE, M.A.

J. T. FLEMING, M.A.

^a Retire by rotation in 1910.**Economic Science Section.**THOMAS JONES, M.A. *President.*

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JOHN MANN, Jun., M.A., C.A., }

} *Vice-Presidents.*WILLIAM A. MACLEAN, M.A., 142 St. Vincent Street, *Hon. Secretary.*A. C. MACDIARMID, C.A., Marston, Dundonald Rd., Dowanhill, *Hon. Treas.**Members of Council.*

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NEIL J. MACLEAN, B.Sc.

H. NEWSOM.

Councillor J. W. PRATT.

J. V. STEVENSON.

WILLIAM KENNEDY, M.A.

COMMITTEES APPOINTED BY THE COUNCIL.**Committee on Finance.**

THE PRESIDENT.	JOHN MANN.
C. H. ROEMMELE.	JOHN MANN, Jun., <i>Convener.</i>
Dr JOHN INGLIS.	

Committee on The Library.

THE PRESIDENT.	Dr JOHN INGLIS.
Professor ARCHIBALD BARR.	THOMAS JONES.
F. T. BARRETT.	Professor GRAHAM KERR.
Professor BOWER.	Dr KNIGHT, <i>Convener.</i>
J. T. T. BROWN.	FRED. G. MACKILLOP.
Dr BROWNLEE.	Dr SNODGRASS.
Bishop CAMPBELL.	Dr MUIRHEAD.
Professor FERGUSON.	Dr MURRAY.
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British Journal of Photography.	Journal of Gas Lighting.
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Building News.	La Nature.
Chemical News.	Nature.
Comptes Rendus.	Notes and Queries.
County and Municipal Record.	aPharmaceutical Journal.
aDeutsche Kolonialzeitung.	aPublishers' Circular.
Dingler's Polytechnisches Journal.	Science.
Electrical Review.	Scientific American and Supplement.
Electrician.	Zeitschrift für Angewandte Chemie.
aEngineering.	

FORTNIGHTLY.

Annalen der Chemie (Liebig's).	Journal de Pharmacie et de Chimie.
aBerichte der Deutschen Chemischen Gesellschaft.	Journal für Praktische Chemie.

MONTHLY.

aAmerican Chemical Journal.	Antiquary.
American Journal of Science.	Beiblätter zu den Annalen der Physik.
Analyst.	Bulletin de la Société Chimique de Paris.
Annalen der Physik.	Bulletin de la Société Géologique de France.
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Annals and Magazine of Natural History.	

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| <p> <i>a</i>Engineering Review.
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 <i>a</i>Tijdschrift van het Koninklijk Nederlandsch Aardrijkskundig Genootschap.
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 Zeitschrift für Analytische Chemie. </p> |
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QUARTERLY.

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| <p> Annals of Botany.
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Royal Philosophical Society of Glasgow
FOR 1909-1910.

HONORARY MEMBERS.

(*Limited to Twenty.*)

WITH YEAR OF ELECTION.

FOREIGN.

Rudolph Albert von Kölliker, Würzburg.	-	-	-	-	-	-	-	1860
Professor Ernst Heinrich Hæckel, Jena.	-	-	-	-	-	-	-	1880
Professor Georg Quincke, Hauptstrasse 47, Friederichsbau, Heidelberg.	-	-	-	-	-	-	-	1890

AMERICAN AND COLONIAL.

Thomas Muir, M.A., LL.D., F.R.S.S., L. and E., Superintendent General of Education, Cape Colony.	-	-	-	-	-	-	-	1892
5 Archibald Byron Macallum, M.A., M.B. (Tor.), Th.D. (Johns Hopkins), Sc.D. (Yale), LL.D. (Aberd.), F.R.S., University of Toronto, 59 St. George Street, Toronto, Canada,	-	-	-	-	-	-	-	1908

BRITISH.

Sir Joseph Dalton Hooker, C.B., G.C.S.I., M.D., D.C.L., LL.D., F.R.S., The Camp, Sunningdale.	-	-	-	-	-	-	-	1874
The Right Hon. Lord Rayleigh, M.A., D.C.L., LL.D., F.R.S., F.R.A.S., F.R.S.G., Hon. Prof. of Nat. Philosophy in the Royal Institution, London, Terling place, Witham, Essex.	-	-	-	-	-	-	-	1890
The Right Hon. Lord Lister, O.M., LL.D., D.C.L., F.R.S., 12 Park crescent, Portland place, London, W.	-	-	-	-	-	-	-	1895
Sir Archibald Geikie, LL.D., D.Sc., F.R.S., F.R.S.E., F.G.S., Shepherd's Down, Haslemere, Surrey,	-	-	-	-	-	-	-	1895
10 Professor Edward Albert Schäfer, LL.D., F.R.S., M.R.C.S., University of Edinburgh.	-	-	-	-	-	-	-	1902
Sir William Ramsay, K.C.B., LL.D., D.Sc., Ph.D., F.R.S., Professor of Chemistry, University College, London, 19 Chester Terrace, Regent's Park, London, N.W.	-	-	-	-	-	-	-	1904
Sir William Crookes, D.Sc., F.R.S., 7 Kensington Park Gardens, London, W.,	-	-	-	-	-	-	-	1908
Sir David Gill, K.C.B., LL.D., D.Sc., F.R.S., F.R.A.S., 34 De Vere Gardens, Kensington, London, W.,	-	-	-	-	-	-	-	1908

CORRESPONDING MEMBERS.

WITH YEAR OF ELECTION.

Sir Thomas E. Thorpe, Ph.D., F.R.S., F.R.S.E., Principal of the Government Laboratories, Clement's Inn-passage, W.C.	1874
John Aitken, LL.D., F.R.S., F.R.S.E., Ardenlea, Falkirk.	1883
Sir James Dewar, M.A., F.R.S., F.R.S.E., M.R.I., Jacksonian Professor of Physics, University of Cambridge, and Professor of Chemistry in the Royal Institution of Great Britain, 1 Scroope terrace, Cambridge.	1883
Sir Joseph W. Swan, M.A., D.Sc., F.I.C. F.C.S., M.I. Mech. E., Hon. M.I.E.E., F.R.S., Overhill, Warlingham, Surrey,	1883
5 William Milne, M.A., B.Sc., F.R.S.E., Uitenhage, Cape Colony,	1894
Richard Lodge, M.A., Professor of History in Edinburgh University.	1899
Edmund J. Mills, D.Sc., LL.D., F.R.S., Emeritus Professor of Technical Chemistry, Glasgow and West of Scotland Technical College, 64 Twyford avenue, West Acton, London, W.	1901
Arthur Schuster, Ph.D., F.R.S., Victoria park, Manchester,	1901
W. S. M'Cormick, M.A., LL.D., 2 St Andrew's square, Edinburgh.	1902
10 John George Bartholomew, F.R.S.E., F.R.G.S., Geographical Institute, Park road, Edinburgh.	1902
James Burgess, C.I.E., LL.D., F.R.S.E., Hon. A.R.I.B.A., F.R.G.S., 22 Seton place, Edinburgh.	1902
Frederick Emley, Literary and Philosophical Society of Newcastle-upon-Tyne.	1902
Professor Cargill G. Knott, D.Sc., F.R.S.E., 42 Upper Gray street, Edinburgh.	1902
Principal John Yule Mackay, M.D., LL.D., University College, Dundee.	1902
15 Professor John Millar Thomson, LL.D., F.R.S., F.I.C., F.C.S., King's College, and 9 Campden Hill Gardens, London, W.	1902
Professor Robert Wallace, F.R.S.E., F.L.S., F.C.S., University of Edinburgh.	1902

ORDINARY MEMBERS.

WITH YEAR OF ENTRY.

a Denotes Life Members.

<i>a</i> Adam, Thomas, F.S.I., 27 Union street.	1892	10 Alexander, D. M., 5 Derby crescent, Kelvinside.	1887
Adams, John, M.B., 1 Queen's crescent, W.	1902	Alexander, James, D.L., 145 North street.	1909
Adams, William, Makerstoun, Bearsden.	1891	Allan, Claud A., Kilmahew, Cardross, Dumbartonshire.	1910
Addison, W. H., Superintendent Mount Florida Deaf and Dumb Institution.	1895	<i>a</i> Allan, Henry, 2 Park gardens.	1900
5 <i>a</i> Agar, Thomas F., Argentine Consul-General, 30 George square.	1896	<i>a</i> Allan, James A., 21 Bothwell st.	1904
Agar, Wilfred E., M.A., 1 Eton gardens, Hillhead.	1908	15 <i>a</i> Allan, Robert S., 15 Woodside terrace.	1908
Aiken, James, of Dalmoak, 201 West George street.	1905	Alston, J. Carfrae, 9 Lorraine gard.	1887
Aikman, W. G., 12 Kingsborough gardens, Kelvinside.	1899	Anderson, Alexander, 157 Trongate.	1869
Aiton, Alexander Hamilton, 190 West George street.	1902	<i>a</i> Anderson, Alexander, C.E., Farme Cottage, Rutherglen.	1907
		Anderson, A. Harvie, 18 Park circus.	1910
		20 <i>a</i> Anderson, David H., Clarendon, Helensburgh.	1904
		Anderson, James, c/o Anderson & Co., 12 Princes square.	1900

- Anderson, James, 168 George street. 1890
- Anderson, James Scott, Bardowie Castle, Milngavie. 1902
- Anderson, John, 142 West Nile street. 1884
- 25 Anderson, J. B. Mackenzie, M.B., 8 Buckingham terrace, Hillhead. 1895
- Anderson, R. T. R., 42 Roselea drive. 1889
- Anderson, Robert, 76 Bath street. 1896
- Anderson, Robert, Eastwoodhill, Giffnock. 1900
- aAnderson, Robert Locke, 233 St Vincent street. 1901
- 30 Anderson, Wm, 12 Princes square. 1900
- aAnderson, William, 133 Wellington street. 1890
- Anderson, William, J., C.A., 149 West George street. 1906
- Anderson, William, J.P., 59 Kirklee road, Kelvinside. 1909
- Anderson, W. Boyd, 137 St Vincent street. 1908
- 35 Andrew, Grant, 12 Woodside terrace. 1900
- aAndrew, James, 160 West George street. 1900
- Angus, Robert, Ladykirk, Monkton, Ayrshire. 1901
- aAnnan, J. Craig, 518 Sauchiehall street. 1888
- Arneil, Allan, Craigenrig, Stewarton drive, Cambuslang. 1901
- 40 aArnot, J. L., 204 Bath street. 1890
- aArrol, Sir William, LL.D., Seafield, Ayr. 1900
- aArthur, Andrew, 78 Queen street. 1902
- Arthur, Henry M., C.A., 79 West Regent street. 1908
- aArthur, James, 78 Queen street. 1900
- 45 Arthur, Sir Matthew, Bart., 78 Queen street. 1900
- Baird, Allan F., 192 St. Vincent street. 1904
- aBaird, J. G. A., Wellwood, Muirkirk. 1892
- aBalfour, Alexander, Kelvindare, Cambridge drive, Kelvinside. 1900
- Balfour, John A., F.R.Hist.S., Kelvindare, Cambridge drive, Kelvinside, Glasgow. 1907
- 50 Ballantine, George, jun., 100 Union street. 1897
- Bannatyne, Dugald, C.A., 191 West George street. 1907
- Barbour, Wm, M.B., C.M., 3 Edelweiss terrace, Partick. 1900
- Barclay, A. J. Gunion, M.A., F.R.S.E., High School. 1893
- Barclay, A. P., 133 St Vincent street. 1890
- 55 Barclay, George, 8 Windsor circhs. 1891
- Barclay, James, 16 Roxburgh street, Kelvinside. 1871
- Barman, Harry D.D., 21 University gardens. 1904
- Barnet, John, 73 Robertson street. 1901
- aBarr, Archibald, D.Sc., Professor of Civil Engineering and Mechanics in the University of Glasgow, Westerton, Milngavie, N.B. 1890
- 60aBarr, James, C.E., I.M., F.S.I., 221 West George street. 1883
- Barr, Patrick, 51 Bath street. 1902
- Barr, Thos, M.D., F.F.P.S.G., 13 Woodside place, W. 1879
- aBarr, Thomas H., Wimborne, Kilmacolm. 1909
- Barrett, Francis Thornton, Mitchell Library. 1880
- 65 Bauermeister, F., 49 Gordon street. 1901
- Baxter, John, I.M., 243 St Vincent street. 1901
- Baxter, W. R., 36 Sutherland terrace. 1900
- Beardmore, W., Parkhead Forge. 1901
- Beatson, Sir George T., B.A. (Cantab.), M.D., 7 Woodside crescent. 1881
- 70 Becker, L., Ph.D., Professor of Astronomy in the University of Glasgow, The Observatory. 1895
- Beckett, Charles E., M.A., LL.B., 163 St Vincent street. 1903
- Beckett, William, M.A., 225 West George street. 1900
- Beedle, Peter D. Ridge, 18 Ashton gardens. 1902
- Begg, Wm, 636 Springfield road. 1883
- 75 Beilby, George T., LL.D., F.R.S., 11 University gardens, Hillhead. 1895
- Bell, George, architect, 212 St Vincent street. 1900
- aBell, Henry, Mynthurst, Reigate, Surrey. 1876
- Bell, Sir James, Bart, 135 Buchanan street. 1877
- aBell, James T., 330 Mansfield road, Nottingham. 1896
- 80aBell, John J., Clyde Cottage, Craighendran. 1896
- aBennett, Professor Peter, *Secretary*, 40 Claremont street. 1900
- Bennett, Robert J., Savoy park, Ayr. 1883
- Bergius, William M., 14 St. Enoch square. 1907
- aBerry, Arthur J., 5 University gdns. 1909
- 85 Berry, R. A., Professor of Chemistry, West of Scotland Agricultural College; 6 Blythswood square. 1906

- aBiggart, Thomas, 105 West George street. 1900
 aBilsland, Sir William, Bart., 28 Park circus. 1888
 Binnie, Thomas, Junr., M.A., 3 Park Gate. 1903
 aBirkmyre, John, Broadstone, Port-Glasgow. 1900
 90aBishop, A. Henderson, Thornton hall, Lanarkshire. 1896
 Black, J. Albert, Lagarie, Row. 1869
 Black, Malcolm, M.D., 5 Canning place. 1880
 aBlack, William Dunn, J.P., The Manor House, Wallington, Surrey. 1901
 aBlackie, J. Alexander, 17 Stanhope street. 1881
 95aBlackie, J. Robertson, North Bank, Downahill. 1881
 aBlackie, Walter W., B.Sc., The Hill House, Helensburgh. 1886
 Blair, Alexander, F.S.I., 8 Leslie road, Pollokshields. 1908
 Blair, William, 24 St Vincent place. 1902
 aBlyth, Robert, Balvonie, Skelmorlie. 1885
 100 Blythswood, The Right Hon. and Rev. Lord, Renfrew. 1909
 Bonham, Herbert, Greenholm, Drumchapel. 1909
 Borthwick, James D., 46 Balshagray avenue, Partick. 1891
 aBoston, Alexander L., 12 Argyle arcade. 1902
 Bottomley, James T., M.A., Hon. LL.D. (Glas.), D.Sc., F.R.S., F.R.S.E., F.C.S., 13 University gardens, Hillhead. 1880
 105 Bottomley, Wm, C.E., 15 University gardens. 1880
 Bower, F.O., D.Sc., M.A., F.R.S., F.L.S., Regius Professor of Botany in the University of Glasgow, 1 St John's terrace, Hillhead. 1885
 Bowers, John, *Depute* Town Clerk, City Chambers. 1904
 Boyd, James, Glenhead, Lenzie. 1905
 Boyd, John, Shettleston iron-works, near Glasgow. 1873
 110 Boyd, T. A., Shettleston iron works, Glasgow. 1908
 aBoyne, James, Duncliffe, Bearsden. 1901
 Brander, George, 14 Kelvinside gardens, N. 1909
 aBroadfoot, William R., Inchholme Works, Whiteinch. 1900
 Brock, Henry, Darleith, Cardross, Dumbartonshire. 1905
 115 Brodie, William, B.L., 77 St Vincent street. 1902
 Bromhead, Horatio K., F.R.I.B.A., I.A., 18 Kirklee road, Kelvinside. 1901
 Brown, Adam Gillison, 18 Royal terrace, West. 1909
 Brown, George Arbuckle, M.B., C.M., D.P.H. (Camb.), 180 Hyndland road, Kelvinside. 1900
 aBrown, Hugh, Croftmore, Skelmorlie. 1887
 120 Brown, James, 76 St Vincent street. 1876
 Brown, John Armour, Moredum, Paisley. 1901
 Brown, J. T. T., Kessiebank, Cambuslang. 1902
 aBrown, Nicol Paton, 22 Belhaven terrace. 1901
 Brown, Richard, Writer, 166 St Vincent street. 1895
 125aBrown, Wm Stevenson, 67 Washington street. 1886
 aBrown, William, 165 West George street. 1892
 Brown, Robert, B.Sc., 45 Washington street. 1893
 Brownlee, Jno., M.D., Glasgow Fever Hospital, Belvidere. 1902
 Brownlie, John Douglas, M.B., Ch.B. L.D.S., 10 Brandon place. 1901
 130 Bruce, Alex., Clyne House, Pollokshields. 1901
 Bryce, Thomas H., M.A., M.D., Professor of Anatomy in the University of Glasgow, 2 The College. 1908
 aBuchanan, Andrew, Dunfillan, Helensburgh. 1902
 Buchanan, George Douglas, Silverrae, Giffnock. 1901
 Buchanan, Robert Macneil, M.B., C. M., F.F.P.S.G., Corindi, Scotstounhill. 1900
 135 Buchanan, Walter, Dunclutha, Tollcross. 1909
 aBuchanan, Wm. Enderley, Bearsden. 1886
 Burnet, John James, LL.D., A.R.S.A., F. R. I. B. A., 70 University avenue. 1892
 aBurrell, Wm. 54 George Square. 1900
 Burr, Robert A., M.A., B.Sc., 7 Lothian gardens, Thistle park, Cardonald. 1904
 140 Caird, Robert, LL.D., F.R.S.E., 56 Esplanade, Greenock. 1898
 aCaldwell, George B., Scotia Leather Works, Boden street. 1892
 Caldwell, James, 6 Newton place. 1900
 Cameron, Hugh Crawford, 21 Kelvin-grove street. 1910
 Cameron, Sir Hector C., M.D., Professor of Clinical Surgery, University of Glasgow, 18 Woodside crescent. 1873
 145aCampbell Andrew, Springfield quay. 1895

- Campbell, James Murdoch, 147 George street. 1901
- Campbell, John, 49 St. Andrew's drive, Pollokshields, 1901
- ^aCampbell, John Ferguson, 15 Montgomerie street, North Kelvinside. 1892
- Campbell, John M., F.E.I.S., Sir John Neilson Cuthbertson School, and 14 Royal crescent, Crosshill. 1900
- ¹⁵⁰ Campbell, John MacNaught, C.E., F.Z.S., F.R.S.G.S., 6 Franklin terrace, Dumbarton road. 1883
- Campbell, Malcolm, 18 Gordon street. 1894
- Campbell, M. Pearce, 9 Lynedoch crescent. 1905
- Campbell, Joseph Dawson, 142 West George street. 1903
- ^aCampbell, Thomas, Maryhill Iron works. 1894
- ¹⁵⁵ Campbell, The Right Reverend Archibald E., D.D., Bishop's House, Woodside terrace. 1904
- Campion, Alfred, Technical College, Glasgow. 1910
- Cant, James, Kilmeny, Ardrossan. 1901
- Carlaw, Alec Lyle, 14 Fitzroy place. 1908
- Carrick, John, 26 Renfield street. 1905
- ¹⁶⁰ Carson, D. S., C.A., J.P., St. Oswalds, Kilmacolum. 1905
- Carswell, John, F.F.P.S.G., L.R.C.P.Ed., 5 Royal crescent, West. 1903
- Carver, Thomas, A.B., B.Sc., D.Sc., C.E., 8 Windsor quadrant, Kelvin-side. 1890
- ^aCayzer, Sir Charles W., 109 Hope street. 1886
- Chalmers, A. K., M.D., D.P.H. (Camb.), 4 Grosvenor terrace, Hill-head. 1892
- ¹⁶⁵ Chalmers, P. MacGregor, I.A., F.S.A.Scot., 95 Bath street. 1891
- ^aChisholm, Sir Samuel, Bart., LL.D., 20 Belhaven terrace. 1890
- Christie, James Robertson, M.A., LL.B., 3 Gloucester place, Edinburgh. 1903
- ^aChristie, Henry W., 46 West George street. 1892
- Christie, John, Turkey-red Works, Alexandria, Dumbartonshire. 1868
- ^{170a}Christison, George, 13 Cambridge drive. 1897
- Chrystal, W. J., F.I.C., F.C.S., Shawfield Works, Rutherglen. 1882
- Clanachan, John, 4 Lloyd street, Dennistoun. 1900
- Clark, Geo. H., M.B., Ch.B., D.P.H., 15 Clarence drive. 1908
- Clark, John, M.A., 24 Park gardens, N. Broomhill. 1897
- ¹⁷⁵ Clark, Wm, 16 Montgomerie crescent, W. 1910
- Cleghorn, Alexander, 14 Hatfield drive, Kelvinside. 1904
- ^aCleland, John, M.D., LL.D., D.Sc., F.R.S., Emeritus Prof. of Anatomy, University of Glasgow, Drumclog, Crewkerm, Somersetshire. 1884
- ^aCoats, Archibald, Woodside, Paisley. 1900
- Coats, John J., M.A., 27 Woodside place. 1900
- ^{180a}Coats, Sir Thomas Glen, Bart., M.P., Ferguslie Park, Paisley. 1905
- Coghill, William C., 24 Douglas Street. 1873
- ^aColville, Archibald, The Moorings, Motherwell (and Arngomery, Kippen). 1905
- Colville, David, Jerviston House, Motherwell. 1905
- ^aCombe, James Russell, 10 Camphill avenue, Langside. 1895
- ^{185a}Connell, Charles Broadfoot, Scotstoun Shipbuilding Yard, Whiteinch. 1900
- ^aConnell, James G., 44 St Enoch's sq. 1900
- Cook, William, 77 St Vincent street. 1900
- Cooper, David, Woodend, Giffnock. 1905
- Copland, W. R., 146 West Regent street. 1908
- ¹⁹⁰ Corbet, Robert, Actuary, Barcaldine, Springkell avenue, Maxwell park. 1909
- Core, Wm, M.D., Stobhill Hospital, Springburn. 1891
- Costigane, William, Clifton Hall, Albert Drive, Pollokshields. 1890
- Coubrough, A. Sykes, J.P., Blane-field, Stirlingshire. 1869
- Coulson, W. Arthur, 47 King street, Mile-end. 1888
- ¹⁹⁵ Couper, James, Craigforth House, Stirling. 1862
- Couper, Sinclair, Moore Park Works, Helen street, Govan. 1896
- Cowie, Archibald, 20 Blythswood square. 1900
- Craig, T. A., C.A., 139 St Vincent street. 1886
- ^aCrawford, R. C., 12 Derby crescent, Kelvinside. 1902
- ²⁰⁰ Cree, H. G., 37 West Nile Street. 1908
- Cree, Charles D., 21 Exchange square. 1910
- ^aCrookston, George B., 188 St Vincent street. 1900
- Crosbie, Warren, B.L., 30 George street. 1904

- Cross, Alexander, 14 Woodlands terrace. 1887
- 205aCrum, Walter G., Dalnotter house, Old Kilpatrick. 1895
- Crum, William G., Auchenbowie, Bannockburn. 1896
- aCullen, Alexander, F. R. S. E., F. R. I. B. A., 3 Blythwood square. 1901
- aCarphey, Wm Salvador, 7 Derby crescent, Kelvinside. 1883
- Currie, John, 31 Westbourne gardens. 1905
- 210 Cuthbertson, John, M. A., F. E. I. S., 97 Greenhead street. 1909
- aDaly, James, 2 Prince's gardens. 1898
- aDalziel, T. Kennedy, M. B., C. M., 196 Bath street. 1896
- Dansken, A. B., 109 St. Vincent Street. 1877
- Davidson, David, 7 Bute Mansions, Hillhead. 1905
- 215 Davidson, John, Auldfield, Pollokshaws. 1910
- Davies, Thomas O., 35 Stockwell street. 1910
- Denham, Walter, F. F. A., F. I. A., 2 Kelvinside terrace, N. 1908
- Denholm, David, 75 Waterloo street. 1910
- Desch, Cecil H., D. Sc., Ph. D., 9 Spring gardens, N. Kelvinside. 1910
- 220 Dewar, David, 362 St George's road. 1903
- Dewar, Jas, M. A., F. E. I. S., Schoolhouse, Chryston. 1909
- Dick, Thomas, 166 St Vincent street. 1901
- Dickie, John S., 30 Renfield street. 1900
- Dishington, Thomas T. M., M. B., Ch. B., Ranfurly Lodge, Bridge-of-Weir. 1909
- 225aDixon, James S., Fairleigh, Bothwell. 1900
- Dixon, Walter, Derwent, Kelvinside gardens. 1893
- Dixon, W. Macneile, M. A., Litt. D., Professor of English Language and Literature in the University of Glasgow, 2 South Park terrace, Hillhead. 1906
- Dobbie, A. B., M. A., 24 West Cumberland street. 1885
- aDobbie, Robert, Beechmount, Larchbert. 1900
- 230 Donald, Geo., M. A., c/o Macdonald, 6 Windsor street. 1909
- aDonald, James Addie, 12 Waterloo street. 1900
- Donald, James, Banker, Springburn. 1908
- Donald, William, J. A., Devonport, Greenfaulds, Cumbernauld. 1877
- Donaldson, Henry J., B. L., c/o Mackay & Macintosh, 124 St Vincent street. 1908
- 235 Donaldson, William G. K., County buildings, Glasgow. 1909
- Douglas, James R., Broxtowe, Newark drive, Pollokshields. 1907
- Downie, J. Walker, M. B., C. M., F. F. P. S. G., 4 Woodside crescent. 1901
- Downie, Thomas, Hydepark Foundry. 1886
- aDreghorn, David, Greenwood, 188 Nithsdale Road, Pollokshields. 1896
- 240aDuncan, Eben., M. D., C. M., F. F. P. S. G., Queen's Park house, Langside road, *Hon. Vice-President*. 1873
- Duncan, J. A., Aston, Bridge of Allan. 1896
- aDuncan, Robert, Whitefield Works, Govan. 1890
- Dunlop, David John, Inch Works, Port-Glasgow, and 198 Bath street. 1900
- Dunlop, John, F. E. I. S., headmaster, Quarry Brae Public School, Parkhead. 1900
- 245 Dunlop, John, M. D., 1 Somerset place. 1900
- aDunlop, Sir Nathaniel, 25 Bothwell street. 1870
- aDunlop, Thomas, 70 Wellington street. 1902
- Dunn, Robert Hunter, 4 Crown terrace, Dowanhill. 1878
- Dyer, Henry, M. A., D. Sc., C. E., 8 Highburgh terrace, Dowanhill. 1883
- 250 Eadie, George, 405 Mathieson street. 1908
- aEdington, George Henry, M. D., M. R. C. S. (Eng.), F. F. P. S. G., 20 Woodside place. 1896
- Edmiston John C., M. D., F. F. P. S. G., 24 Wilton gardens, Kelvinside, N. 1901
- aEdwards, John, 4 Great Western terrace, West. 1883
- Elliott, Joseph J., City Chambers. 1901
- 255 Ellis, David, D. Sc. (Lond.), Ph. D. (Marburg), Lecturer in Botany, Technical College, Glasgow, Kersland drive, Milngavie. 1905
- Erskine, Jas, M. A., M. B., L. F. P. S. G., 351 Bath street. 1886
- Ewan, Thomas, M. Sc., Ph. D., 22 Holyrood crescent, W. 1901
- Ewing, James C., Brighton House, Bertrohill road, Shettleston. 1902
- aEwing, Wm, 14 St Vincent place. 1883

- 260 Fairlie, H. P., M.B., Ch.B., 402
Sauchiehall street. 1909
- aFail, John, 7 Winton drive, Kel-
vinside. 1901
- Fairweather, Wallace, C.E., 62 St.
Vincent street. 1880
- Falconer, John M., Margham,
Broomhill drive, Partick. 1906
- Falconer, Patrick, 13 Sutherland
street, Hillhead. 1876
- 265aFarquhar, Jas T., 47 Hope street. 1901
- Farquhar, Wm R., St Malo, Kil-
macolm. 1892
- Farquharson, William H. S., 45
Calderwood road, Rutherglen. 1909
- Farrelly, John, 25 Elmbank cres. 1901
- Fawsitt, Charles A., 9 Foremount
terrace, Partick. 1879
- 270aFergus, Freeland, M.D., F.R.S.E.,
F.F.P.S.G., *Hon. Secy.*, 22 Blyths-
wood sq. 1887
- Fergus, James, 58 York street. 1901
- aFergus, Oswald, D.D.S., L.D.S.,
F.R.S.E., 12 Clairmont gardens. 1896
- aFerguson, David, Glenholm, Port-
Glasgow. 1901
- Ferguson, George, 136 Bishop street,
Port Dundas. 1904
- 275aFerguson, John, M.A., LL.D., F.R.S.E.,
Professor of Chemistry, University
of Glasgow, *Hon. Vice-President.* 1869
- Ferguson, John A., Kilmeny, Kirk-
lee road, Glasgow. 1905
- Ferguson, John Forbes, 166 St
Vincent street. 1895
- aFleming, E. Brown, Kilchoan, by
Oban, Argyllshire. 1900
- aFleming, Sir James, 136 Glebe st. 1880
- 280aFleming, John, 241 St Vincent st. 1900
- Fleming, John, 1 Lynedoch terrace. 1910
- Fleming, John T., M.A., 129 Bath
street. 1908
- aFletcher, Donald C., 37 Kelvinside
gardens, Kelvinside, N. 1909
- Forgan, D. L., 302 Buchanan street. 1908
- 285 Foster, W. A., St Catherine's, New-
lands road, Langside. 1899
- Fotheringham, T. B., 50 Barrland
street, Maxwell road. 1889
- aFowler, John, 164 St. Vincent street. 1880
- Fraser, Melville, 31 St Vincent place. 1890
- aFraser, Robert, 55 West Regent st. 1909
- 290aFraser, Thomas Smellie, F.S.I.,
209 St Vincent street. 1900
- aFraser, Wm, F.S.I., 209 St Vin-
cent street. 1900
- aFrench, Thomas, 1 Kelvinside ter. 1897
- Frew, Alex., C.E., Assoc. M. Inst. C.E.,
216 West George street 1876
- Frew, Gordon Thomson, 216 West
George street. 1909
- 295aFrew, William, Ph.D., c/o H.
Whiteway, Esq., The Orchards,
Whimple, Devon. 1898
- Fryers, Arthur John, 22 Bath street,
Largs. 1899
- aFullerton, Robt., M.D., 24 Newton
place. 1896
- Fulton, James, The Glen, Paisley. 1897
- Fulton, James, 33 Hamilton drive,
Hillhead. 1902
- 300 Fyfe, A. Peden, 124 St Vincent
street. 1900
- Fyfe, Henry B., 115 St Vincent
street. 1892
- Fyfe, John W., F.S.I., 221 West
George street. 1905
- aGairdner, C. D., C.A., 115 St Vin-
cent street. 1886
- Galbraith, John Alexander, 9
Lancaster crescent, Kelvinside. 1902
- 305 Galbraith, John S., B.L., J.P., 30
Renfield street. 1910
- Galbraith, Peter, 4 Beaumont Gate,
Dowanhill. 1889
- Galbraith, Walter M., 7 Holyrood
crescent. 1893
- Galloway, T. Lindsay, M.A., F.G.S.,
109 Hope street. 1881
- Gardiner, F. C., 14 St. Vincent
place. 1907
- 310 Gardiner, James, Belleville, Hatfield
drive, Keivinside. 1908
- Gardiner, William G, 4 Buckingham
terrace, Glasgow. 1907
- Gardner, Alexander, Architect, 134
Bath street. 1906
- Gardner, Daniel, 36 Jamaica street. 1869
- Gardner, John, 146 Trongate. 1901
- 315 Gardner, John R., 33 Huntly gardens,
Kelvinside. 1900
- aGarraway, John, 694 Duke st. 1875
- Gemmill, James Fairlie, M.A., M.D.,
21 Endsleigh gardens. 1901
- Gemmill, William, 140 Woodstock
avenue, Shawlands. 1903
- Gibson, Charles R., Lynton, Manse-
wood, by Pollokshaws. 1895
- 320 Gibson, Geo. A., M.A., LL.D.,
F.R.S.E., Professor of Mathemat-
ics in the University of Glasgow. 1909
- Gibson, James, M.A., Head Master,
Woodside Public School. 1905
- Gilfillan, W. B., 30 Hamilton Park
terrace. 1910
- Gillies, F. H., Thornly Park, Potter-
hill, Paisley. 1905
- aGillies, William, 23 University
gardens. 1901
- 325 Gillies, W. D., 17 Royal Exchange
square. 1872

- Glaister, John, M.D., F.F.P.S.G., D.P.H. (Camb.), F.R.S.E., F.C.S., &c., Professor of Forensic Medicine and Public Health, University of Glasgow, 3 Newton place. 1879
- aGlaister, Joseph Newbigging, M.B., C.M., 4 Grafton place. 1900
- aGlen, Lawrence, 153 St Vincent street. 1900
- aGlen, Robert, Carlston, Kelvinside. 1901
- 330 Goldie, James, 52 St Enoch square. 1883
- Goodwin, Robert, C.E., 3 Lynedoch street. 1875
- Goold, James B., Bank of Scotland, Trongate. 1902
- aGordon, James, Stonebyres, 14 Aytoun road, Pollokshields. 1901
- Goudie, J. H., 25 Miller road, Ayr. 1909
- 335aGourlay, Charles, B.Sc., A.R.I.B.A., Professor of Architecture, Glasgow Technical College, 30 Hamilton drive, Hillhead. 1900
- Gourlay, Robert, LL.D., 5 Marlborough terrace. 1904
- Gow, John Barnett, 21 West Nile street. 1910
- Gow, Leonard, 45 Renfield street. 1889
- Gow, Leonard, jun., 45 Renfield street. 1884
- 340 Graham, Sir John Hatt Noble, Lambert House, Stirlingshire. 1900
- aGraham, Robert, 108 Eglinton street. 1888
- aGraham, William, B.L., 198 West George street. 1885
- Graham, Wm Edward Auld, 7 Royal Bank place. 1900
- Grant, Rev. James Bell, B.D., 113 Hill street, Garnethill, St. Stephen's Parish Church. 1903
- 345 Gray, Albert A., M.D., 14 Newton terrace. 1903
- Gray, Andrew, LL.D., F.R.S., Professor of Natural Philosophy in Glasgow University. 1899
- Gray, James G., D.Sc., Lecturer on Physics in the University of Glasgow. 1909
- aGray, Thomas, D.Sc., Ph.D., F.I.C., F.C.S., Professor of Technical Chemistry, Glasgow Technical College. 1904
- aGregory, Professor J. W., D.Sc., F.R.S., Glasgow University. 1904
- 350 Green, George, J.P., 40 Balshagray avenue, Partick. 1900
- Greer, Thomas Arthur, Fairfield works, Govan. 1901
- Grieve, W. Weir, 6 Bowmont terrace, Kelvinside. 1905
- Guy, Robert, 120 West Regent street. 1905
- aHamilton, John, I.A., 212 St Vincent street. 1885
- 355 Harrington-Stuart, Colonel R. E. S., Torrance, East Kilbride, N.B. 1900
- Harrington, John C., 3a So. Hanover street. 1901
- aHarrington, J. P., Broadfield, Port-Glasgow. 1900
- Harris, F. W., 32 Kyle Park, Uddingston. 1900
- Harrison, John, J.P., 7 Granby terrace. 1900
- 360 Hawke, Edward G., B.A. (Oxon. and Lond.), 3 North Park terrace. 1910
- Heck, John H., Lloyd's Register, 342 Argyle street. 1910
- aHenderson, Andrew, 15 Cadogan street. 1906
- aHenderson, A. P., 20 Newton place. 1880
- Henderson, Francis, St Vincent place. 1901
- 365 Henderson, George G., M.A., D.Sc., F.I.C., F.C.S., Professor of Chemistry, Glasgow and West of Scotland Technical College, 204 George street. 1883
- Henderson, John, Reigate, Surrey. 1890
- aHenderson, Thomas, 1 Lancaster crescent, Kelvinside. 1900
- Henderson, Thomas Beath, M.D., 25 Lansdowne crescent. 1899
- aHenderson, William, 15 Cadogan street. 1873
- 370 Hendry, Geo. Scott, 310 St. Vincent street. 1895
- Henry, R. W., 21 Oakfield terrace, W. 1875
- Hewat, Andrew, J.P., 14 Grosvenor crescent, Kelvinside. 1906
- Higgins, Henry, jun., 248 West George street. 1878
- Hinshelwood, James, M.A., M.D., 26 Woodside place. 1896
- 375 Hinshelwood, Thomas, Kennyhill house, Dennistoun. 1903
- aHope, James, Dean house, Lenzie. 1898
- Horne, Joseph, M.B., C.M., 45 Windsor terrace. 1900
- aHouldsworth, J. H., Rozelle, Ayr. 1900
- aHouldsworth, Wm Thos, Clerk in Holy Orders, 1 Mansfield street, Portland place, London, W. 1901
- 380 Houston, Andrew, 15 Doune terrace. 1910
- Houstoun, Wm Henry, Glasgow Rubber Works, Maryhill, Glasgow. 1895
- Howat, William, 9 Parkgrove ter. 1885

- aHunt, John, Milton of Campsie. 1881
 aHunter, Richard H., Glentyan, Kilbarchan, Renfrewshire. 1900
 385 Hunter, Robert, 72 Waterloo street. 1901
 Hunter, Walter K., M.D., 7 Woodside place. 1899
 aHunter, Wm S., 70 Robertson street. 1889
 Hutchison, John C., 8 Lansdowne crescent. 1900
 Hutchison, John, M.A., LL.D., 4 St John's terrace, Ann street, Hillhead. 1909
 390 Hutchison, William, LL.B., 208 West George street. 1908
 aHyslop, William, of Bank, New Cumnock. 1901
 Inglis, John, LL.D., Pointhouse Shipyard. 1895
 aInglis, Malcolm, 5 Lancaster cres., Glasgow, W. 1900
 Inglis, R. A., Culrain, Bothwell, 1889
 395 Innes, Gilbert, 16 Kirklee road, Kelvinside. 1900
 Inverclyde, The Right Hon. Lord, 30 Jamaica street. 1905
 aIrons, Joseph Jones, Summerlea, Kilcreggan. 1902
 Jack, George, 2 Wilton gardens, Kelvinside. 1905
 Jack, William Robert, M.D., 43 Lansdowne crescent. 1899
 400a Jack, Wm., M.A., LL.D., Emeritus Professor of Mathematics, Glasgow University. 1881
 aJackson, Harold D., Canton street, Anniesland. 1902
 Jackson, Robert, 16 Dixon avenue, Crosshill. 1902
 Jackson, Thomas, C.A., 24 George square. 1900
 Jenkins, James Graham, Airedale, Cambuslang. 1901
 405 Johnston, Alex., M.D. (Glasgow), D.P.H. (Camb.), Ruchill Hospital. 1900
 Johnston, David, 160 West George street. 1891
 Johnston, William G., Anchor Chemical Works. 1901
 Jones, Thomas, M.A., Prof. Political Economy, University, Belfast. 1906
 Jubb, John, B.L., 124 St Vincent street. 1902
 410 Kay, Arthur, J.P., Tregortha, Winton drive. 1904
 Kay, Cathcart, 77 St Vincent street. 1900
 Kay, Thomas, M.B., C.M., 3 Woodside place. 1899
 Kean, James, 31 Scotia street, Garnethill. 1888
 Kedie, Robert, 11 Eglinton drive, Kelvinside. 1905
 415a Kelly, Alexander, 100 Hyde Park street. 1901
 aKelly, A. Brown, M.D., D.Sc., 26 Blythwood square. 1908
 Kelly, Hugh, M.D., Catrine Bank, Shields road, Pollokshields. 1898
 Kelly, James K., M.D., F.F.P.S.G., Park villa, Queen Mary avenue, Crosshill. 1889
 Kemp, Wm (Alexander, Fergusson, & Co., Ltd), Ruchill, Maryhill. 1898
 420a Kennedy, Alexander, Kenmill House, Bothwell. 1902
 Kennedy, James, 43 Greendyke street. 1889
 Kennedy, John, Airdrie. 1904
 aKennedy, Moses Hunter, 217 West George street. 1901
 aKennedy, William, 13 Victoria crescent, Dowanhill. 1900
 425a Ker, Charles, M.A., C.A., 115 St Vincent street. 1885
 aKer, Wm, 1 Windsor terrace, Kelvinside, West. 1874
 Kerr, Dr John M. Munro, 7 Clairmont gardens. 1910
 Kerr, John G., M.A., LL.D., 15 India street. 1878
 Kerr, J. Graham, M.A., F.R.S., Professor of Zoology, University of Glasgow, 9 The University, Glasgow. 1904
 430 Kerr, Thomas, 8 Dungoyne gardens, Maryhill. 1908
 Kerr, William, 260 West George street. 1902
 Kidston, J. B., 50 West Regent street. 1905
 aKidston, William H., 81 Great Clyde street. 1900
 aKiepe, Johannes N., Imperial German Consul, 137 West George street. 1900
 435a Kiepe, Walter H., M.B., Ch.B., Lismore house, Kelvinside, N. 1910
 aKing, Chas M., Antermony house, Milton of Campsie. 1900
 King, Sir James, Bart, LL.D., of Campsie, 115 Wellington street. 1855
 King, John, 17 Queen's crescent. 1895
 King, John C., J.P., 21 Newton place. 1898
 440 King, Professor L. A. L., 10 Colebrooke street, Kelvinside. 1905
 Kinghorn, J. P., The Anchorage, Burnside. 1909
 Kirk, Rev. Edward Bruce, E.U. Manse, Barrhead. 1905

- Kirkpatrick, Alexander B., 101 St Vincent street. 1885
- Kirkwood, Charles, F.S.I., 14 Grosvenor crescent, Kelvinside. 1908
- 445 Kirkwood, Charles R. B., 3 Westbourne gardens. 1910
- Kirkwood, James, Carling lodge, Ibrox. 1890
- Knight, James, M.A., D.Sc., F.C.S., F.G.S., F.E.I.S., The Shielling, Uddingston. 1893
- aKnox, David J., 19 Renfield street. 1890
- Knox, John, Napiershall School. 1900
- 450aKnox, John, 13 Montgomerie quadrant, Kelvinside. 1902
- Lackie, W. W., 75 Waterloo street. 1905
- Laird, John, Royal Exchange Sale Rooms. 1879
- Lambert, Peter, 1 Carment drive, Shawlands. 1910
- Lamberton, Andrew, Blairtummock, Easterhouse. 1904
- 455 Lamberton, Hugh Alexander, Bewdly, Hags road, Pollokshields. 1901
- aLamberton, Hugh, Surbiton, 52 Dalziel drive, Pollokshields. 1900
- Lambie, Robert, Strathview, Larkhall. 1901
- Lamond, Robert, M.A., LL.B., 163 West George street. 1894
- Lanchester, W. F., M.A., Den of Gryffe, Kilmacolm. 1908
- 460 Lang, Geo., The Wren, Mansewood, by Pollokshaws. 1910
- Lang, Robert, Warrington, Moss road, Pollokshields. 1910
- Lang, William, Crosspark, Partick. 1865
- aLanglands, Alexander, 32 Huntly gardens. 1909
- aLanglands, E. W., 131 West Regent street. 1902
- 465aLauder, James, F.R.S.L., Glasgow Athenæum. 1892
- Lauder, J. C., R.W.S., Art Club, Glasgow. 1910
- aLauder, John, 46 Gordon street. 1894
- Laughland, David, 11 Newton terrace, Glasgow, W. 1901
- Laurie, Malcolm, B.A., D.Sc., F.L.S., Professor of Zoology, The Bloom, Canaan lane, Edinburgh. 1901
- 470 Law, A. Bonar, M.P., Kintillo, Helensburgh. 1905
- Law, Jas H., Brandon house, Ibrox. 1901
- Law, John R. K., 19 St Vincent place. 1896
- Lawrie, Sir Archibald C., LL.D., The Moss, Dungoyne, Stirlingshire. 1905
- aLawson, Thomas, Birchgrove, Pollokshields. 1901
- 475aLindsay, Archd M., M.A., 87 West Regent street. 1872
- aLindsay, John, Conylea, Westbourne gardens, Kelvinside. 1902
- Lipton, Sir Thomas J., Bart., K.C.V.O., Grand Officer of the Crown of Italy, Osidge, Southgate, Middlesex. 1905
- Lobban, William, M.A., Hillesden, Giffnock. 1905
- Lochhead, Dugald Ferguson, 41 Kelvinside gardens, Kelvinside. 1902
- 480 Logan, James, Grammar School, Uddingston. 1902
- Love, Wm., 28 Royal Exchange square. 1901
- aLow, Isaac, 60 Weaver street. 1898
- aLumsden, Harry, M.A., LL.B., 105 West George street. 1900
- Lumsden, James, Arden House, Arden, Dumbartonshire. 1905
- 485 Lyons, Captain H. G., F.R.S., 34 Huntly gardens. 1909
- M'Ara, Alexander, 65 Morrison street. 1888
- Macara, James, 19 Waterloo street. 1901
- aM'Arthur, John S., 74 York street. 1890
- M'Ausland, William F., 51 Buchanan street. 1903
- 490 Macbean, Ed, F.R.G.S., F.R.S.L., 23 Kensington gate, Glasgow. 1901
- M'Bryde, Peter, M.B., 18 Queen's crescent, W. 1900
- M'Calman, George, 150 Hope street. 1905
- aM'Callum, Hugh, M.A., 7 Bute Mansions, Hillhead. 1902
- M'Callum, James A., LL.B., 194 Ingram street. 1910
- 495aM'Callum, Robert, junr., 69 Union street. 1891
- aM'Clelland, Andrew Simpson, C.A., 4 Crown gardens, Dowanhill. 1884
- M'Connachie, John, 204 West George street. 1905
- M'Cosh, Andrew K., Cairnhill, Airdrie. 1901
- aM'Cowan, David, jun., 9 Park circus place. 1898
- 500 M'Cracken, James, 5 Bowmont terrace, Kelvinside. 1889
- M'Crae, John, 7 Kirklee gardens, Kelvinside. 1876
- M'Culloch, Hugh, 154 W. Regent street. 1880
- M'Cunn, John N., Homeview, Mansewood, by Pollokshaws. 1910

- M'Donald, Alexander Beith, M.Inst. C.E., city engineer, City Chambers. 1901
- 505 MacDonald, Andrew, Sherbrooke, Pollokshields. 1909
- MacDonald, Charles, 55 Lochleven road, Langside. 1902
- aM'Donald, John, 72 Great Clyde street. 1896
- M'Dougall, Alexander, M.A., B.Sc., 3 Alexandria terrace, Govan. 1909
- aMacdougall, Robert, F.S.A.A., F.S.I., 63 Bank street, Hillhead. 1900
- 510 Macfarlane, Dr Wm D., Jun., 17 Woodside crescent. 1906
- aMacfarlane, Walter, 22 Park circus. 1885
- M'Farlane, Wm, Edna Lodge, Rutherglen. 1888
- Macfee, John, M.I.E.E., 65 Renfield street. 1905
- Macgeorge, B. B., 24 George square. 1905
- 515 MacGillivray, Duncan, M.A., 7 Newark drive, Pollokshields. 1906
- aM'Gilvray, R. A., 6 Newton terrace. 1880
- MacGregor, D. O., M.D., Victoria Infirmary. 1904
- aMacgregor, R. D., 137 West George street. 1900
- M'Gregor, William, 30 Sutherland terrace. 1909
- 520 Machell, Thomas, 1 Burnbank terrace. 1886
- aMacindoe, Alex., 104 West George street. 1894
- Macintyre, John, M.B., C.M., 179 Bath street. 1895
- aM'Intyre, T. W., Kirkmichael house, Maybole. 1900
- Macintyre, Wm, F.E.I.S., Dalmar-nock School, Glasgow. 1888
- 525aM'Kechnie, D., 14 Candleriggs. 1900
- aM'Kechnie, Wm S., M.A., LL.B., D.Phil., Knightswood, Elderslie, Renfrewshire. 1908
- M'Kellar, John C., 45 West Nile street. 1896
- M'Kellär, J., 25 Kelvinside terrace. 1893
- Mackendrick, Alex., 518 Sauchiehall street. 1905
- 530aM'Kendrick, John G., M.D., C.M., LL.D., F.R.S., F.R.S.E., F.R.C.P.E., *Emeritus*-Professor of Physiology in the University of Glasgow, Maxieburn, Stonehaven, N.B. *Hon. Vice-President*. 1877
- M'Kendrick, J. Souttar, M.D., F.R.S.E., 2 Buckingham terrace. 1900
- Mackenzie, Robert, 176 St Vincent street. 1905
- aM'Kenzie, W. D., 43 Howard street. 1875
- Mackenzie, W. Ferguson, M.B., Ch.B., L.D.S., 25 Buckingham terrace, Hillhead. 1910
- 535 M'Kerrow, W. L., 65 Hamilton drive, Hillhead. 1908
- M'Kie, John, M.B., C.M., 24 Hill-side terrace. 1899
- Mackillop, Fred. G., M.A., LL.B., 208 St Vincent street. 1901
- Mackinlay, Charles A., 5 Belhaven crescent. 1910
- aMackinlay, James Murray, The Lee, Merchiston, Edinburgh, 1886
- 540aMackinlay, J. T. C., 60 Montgomerie drive, Kelvinside. 1900
- Mackintosh, Donald J., M.B., C.M., M.V.O., Western Infirmary, 1894
- aMackinnon, John, 121 Bath street. 1904
- Mackinnon, William, C.A., 34 West George street. 1904
- MacLachlan, Dugald, B.L., 30 Renfield street. 1901
- 545 MacLae, A. Crum, 192 St Vincent street. 1884
- M'Laren, Robert, Royal Bank, Garscube cross. 1898
- M'Lay, James, C.A., 94 Hope street. 1900
- MacLay, William, Thornwood Hall, Langside. 1893
- M'Lean, Angus, B.Sc.(Lond.), C.E., Principal, Technical College, Paisley. 1897
- 550 Maclean, A. B., Craigpark Works, Flemington street, Springburn. 1899
- Maclean, Magnus, M.A., D.Sc., F.R.S.E., Professor of Electrical Engineering, Glasgow and West of Scotland Technical College, 51 Kersland terrace, Hillhead. 1885
- MacLean, Walter, 4 Clairmont gardens. 1909
- aMacLehose, James, M.A., 61 St Vincent street, 1882
- M'Lellan, Dugald, 13 Clarence drive, Hyndland. 1909
- 555 MacLellan, Lewis, 5 Bowmont gardens. 1899
- aMaclellan, Peter, Glasgow Rubber Works, Maryhill. 1900
- aMacLellan, Robert, 3 Clairmont gardens. 1908
- aMaclellan, Wm. Walter, 3 Montague terrace, Kelvinside. 1900
- aMacleod, A., 54 Tytherton road, Tufnell park, London, N. 1893
- 560aMacleod, Frederick Larkins, 142 St Vincent street. 1901

- M'Michael, James, jun, 1 Argyle arcade. 1908
- M'Michael, Thomas, M.A., B.Sc., Nethercraig, Milner road, Jordanhill. 1901
- M'Millan, A. Lewis, M.D., C.M., 1 Rosebery terrace, Great Western road. 1897
- M'Millan, Archibald, 5 Whittinghame gardens. 1899
- 565 M'Millan, Robert, Methlan park, Dumbarton. 1901
- aMacnab, James, Lilyburn, Milton of Campsie, Stirlingshire. 1901
- Macphail, Donald, M.D., Garturk cottage, Whifflet, Coatbridge. 1877
- Macquaker, Thomas, 89 West Regent street. 1902
- Mactaggart, John A., Kelmscott, Springkell avenue. 1908
- 570 M'Vail, Sir David C., M.B., Prof. of Clinical Medicine, St Mungo's College, 3 St James' terrace, Hillhead. 1873
- M'Vail, John C., M.D., D.P.H. (Camb.), 20 Eton place, Hillhead. 1904
- aMacwhannell, Ninian, 58 West Regent street. 1898
- M'Whirter, W., 3 Albany street, Kelvinside. 1901
- Main, Robert B., Lyndhurst, 1 Winton drive, Kelvinside. 1885
- 575aMann, James, Castlecraig, Dolphinton, Peeblesshire. 1900
- aMann, John, C.A., Garth, Bridge-of-Weir, *Hon. Vice-President*. 1856
- aMann, John, jun., M.A., C.A., 142 St Vincent street, *Hon. Treasurer*. 1885
- Mann, Ludovic MacLellan, 144 St Vincent street. 1897
- aMann, Robert M., Rheubeg, Busby. 1900
- 580 Marks, Samuel, 145 Great Eastern road. 1884
- Marr, John, J.P., Dunjarg, Bellahouston, Govan. 1900
- Marr, Hamilton Clelland, M.D., Woodilee Asylum, Lenzie. 1899
- Marshall, James, Woodcroft, Crow road, Partick. 1900
- aMarshall, Robert, 97 Wellington street. 1900
- 585 Martin, James F., 63 Brunswick street. 1895
- Martin, John, writer, 58 West Regent street. 1901
- Martin, Robert, 23 Wilson street, Hillhead. 1897
- Martin, William, 63 Brunswick street. 1903
- Mathie, George M., Mayfield Clin-carthill. 1895
- 590 Mathieson, J. H., 6 Park circus place. 1896
- aMathieson, T. O., 1 Park gardens. 1896
- Mavor, Henry A., 47 Broad street, Mile-end. 1887
- Mavor, Samuel, 37 Burnbank gardens. 1890
- aMaxwell, Sir John Stirling, Bart., Pollok House, Pollokshaws. 1905
- 595 May, A. H., 15 Athole gardens. 1898
- Mechan, Arthur, Scotstoun Iron-works. 1876
- Mechan, Arthur, M.B., Ch.B., 12 Victoria crescent. 1910
- aMehan, Henry, Scotstoun Iron Works, Scotstoun. 1879
- Medley, Dudley J., M.A., Professor of History in Glasgow University, 2 Park quadrant. 1901
- 600 Mellanby, A. L., D.Sc., Professor of Motive Power Engineering, The Technical College, Glasgow. 1905
- Menzies, William Crawford, City Improvement Trust, 22 King st. 1895
- Millar, James, 152 Parliamentary road. 1870
- aMiller, Alexander Wingate, 79 West Nile street. 1900
- Miller, Alexander, junr., 34 Rose street, E. 1899
- 605aMiller, Arch. Russell, Queensmount Helensburgh. 1884
- aMiller, George, Surrey House, Victoria Embankment, London, W.C. 1881
- Miller, Hugh, M.A., F.E.I.S., 2 Bogton Avenue, Cathcart. 1901
- Millar, James G., Sheriff of Lanarkshire, 5 Lorraine gardens. 1908
- aMiller, J. C., 188 St Vincent street. 1900
- 610 Miller, Professor John, M.A., D.Sc., 2 Northbank terrace, Kelvinside. 1910
- aMiller, Thomas Hodgson, Westcroft, Cleveland Walk, Bath. 1901
- aMirrlees, William J., 45 Scotland street. 1889
- Mitchell, Alexander Brown, Glenview, Larkhall. 1901
- aMitchell, Alex. Moncrieff, 8 Kew terrace, Kelvinside. 1903
- 615 Mitchell, Andrew, C.A., The Glasgow District Subway Co., St Enoch square Station. 1896
- aMitchell, Andrew Acworth, 7 Huntly gardens. 1903
- aMitchell, George A., F.R.S.E., 5 West Regent street. 1883
- Mitchell, Wm James, M.A., B.L., 48 West George street. 1897

- aMoffatt, Alexander, 23 Abercromby
 place, Edinburgh. 1874
 620 Mollison, James, 30 Balshagray aven.,
 Partick. 1889
 aMond, Robert Ludwig, B.A.
 (Cantab.), F.R.S.E., 20 Avenue
 road, Regent's park, London,
 N.W. 1890
 aMonro, T. K., M.A., M.D.,
 F.F.P.S.G., Professor of Medicine
 in St Mungo's College, 12 Somerset
 place. 1897
 aMonteith, Robert, Greenbank,
 Dowanhill gardens. 1885
 Moodie, James, M.A., F.E.I.S.,
 Petershill Public School. 1909
 625 Moore, Alexander, C.A., Deanville,
 Bridge of Allan. 1869
 Moore, Alexander George, M.A.,
 B.Sc., 13 Clairmont gardens. 1886
 aMoore, Robert Thomas, D.Sc., 13
 Claremont gardens. 1904
 Morison, Professor John L., M.A.,
 Queen's College, Kingstown,
 Canada. 1907
 Morrice, Jas A., 1 Prince's ter.,
 Dowanhill. 1883
 630aMorton, George, Horslethill road,
 Kelvinside. 1902
 Motion, James Russell, 140 Hynd-
 land road, Kelvinside. 1887
 Motion, Thomas Mason, 54 Grant
 street, W. 1897
 Muir, Alexander, 134 Nithsdale road,
 Strathbungo. 1883
 aMuir, Allan, Ardmay, Newlands
 road, Langside. 1881
 635aMuir, James, D.Sc., M.A., Professor
 of Natural Philosophy, Technical
 College, Glasgow, 31 Burnbank
 gardens. 1904
 Muir, Robert, M.D., F.R.C.P.E.,
 Professor of Pathology in Glasgow
 University, 16 Victoria crescent,
 Dowanhill. 1899
 aMuirhead, Andrew Erskine, Cart
 Forge, Cathcart. 1873
 Muirhead, James, 2 Bowmont gar-
 dens, Kelvinside. 1887
 aMuirhead, Robert F., M.A., D.Sc.,
 64 Great George street, Hillhead. 1879
 640aMunro, Donald Mackay, 88 St
 Vincent street. 1901
 Murdoch, Alexander, 557 Alexandra
 Parade. 1905
 Murdoch, George, 40 St Vincent
 place. 1894
 Murdoch, John, 208 West George
 street. 1901
 Murdoch, John, Chemist, 694 Duke
 street. 1907
 645aMurdoch, Robert, 91 Maxwell
 road. 1880
 aMurray, A. S. 169 West George
 street. 1905
 Murray, C. Hope, jun., 98 West
 George street. 1908
 Murray, Charles Robert, Woodbank,
 Partickhill.
 aMurray, Daniel, 5 Wilton cres-
 cent. 1896
 650aMurray, David, LL.D., 169 West
 George street, *Hon. Vice-President*. 1876
 Murray, John Bruce, 24 George
 square. 1890
 Murray, J. Campbell, 216 West
 George street. 1906
 Murray, R. A., C.A., 175 West
 George street. 1905
 aNaismith, William W., C.A., 57
 Hamilton drive, Hillhead. 1907
 655 Napier, Alex., M.D., F.F.P.S.G.,
 Rose Bank, Queen Mary avenue,
 Crosshill. 1886
 Napier, Robert T., Schiehallion,
 Dunblane. 1899
 Nathan, Colonel Sir Frederick, Nobel
 house, Stevenston, Ayrshire. 1909
 aNeilson, George, LL.D., Wellfield,
 Partickhill road. 1897
 aNeilson, James, 116 Bishop street,
 Port-Dundas. 1896
 660 Neilson, James Wilson, 198 West
 George street. 1909
 aNeilson, John, Mollance, Castle-
 Douglas. 1900
 aNeilson, Walter, Ewenfield, Ayr. 1900
 Nelson, Alex., 63 North Frederick
 street. 1880
 aNelson, John E., 26 Queen street. 1900
 665 Ness, James, M.A., LL.B., 100 West
 Regent street. 1904
 Ness, Professor R. Barclay, M.A.,
 M.B., 19 Woodside place. 1902
 aNewlands, Joseph F., 105 West
 George street. 1883
 Nicol, William Smith, F.F.A., 30
 Renfield street. 1905
 Nicolson, W. B., 54 Hill street,
 Garnethill. 1906
 670aNicoll, Professor James H., M.B., 4
 Woodside place. 1897
 aNisbet, John, 112 Bath street. 1905
 Nish, Robert, 9 Claremont ter-
 race. 1897
 Orr, George Smith, 139 St Vincent
 street. 1901
 aOsborne, Hugh, 4 Kew terrace, 1899
 675aOswald, Dr Landel Rose, Glasgow
 Royal Asylum. 1902

- aPark, Colonel J. Smith, V.D., 20
 Park terrace. 1900
 Parker, James H., B.L., C.A., 89
 West Regent street. 1900
 Parker, Dr W. A., Glasgow District
 Asylum, Gartloch. 1908
 aParker John Dunlop, C.E., 217
 West George street. 1889
 -680aParnie, William, 27 Union
 street. 1897
 Parry, Robert Henry, F.R.C.S.E.,
 25 Blythswood square. 1900
 aPaterson, Robert, C.A., J.P., 105
 West George street. 1881
 Paterson, Thomas Y., 4 Lorraine
 gardens, Dowanhill, Glasgow. 1907
 Paterson, Wm., M.B., C.M. (Edin.)
 43 Millbrae Road, Langside. 1902
 -685 Paton, James, F.L.S., Glasgow Art
 Gallery and Museum, Kelvin-
 grove. 1876
 Paton, Professor D. Noël, M.D.,
 B.Sc., F.R.C.P.E., 4 University
 gardens. 1908
 Patrick, Howard Henderson, M.B.,
 Ch.B., 7 Belmont street. 1909
 Patrick, Joseph, M.A., C.A., 203
 West George street. 1893
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 720 Reid, William, M.A., The Park
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 725aRenwick, Wm, Langgarth, Stirling. 1901
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- a**Ross, John, Lochbrae House, Bearsden. 1885
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- 775 Smart, William, M.A., LL.D., Professor of Political Economy, University of Glasgow, Nunholm, Dowanhill. 1886
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 855 Warren, John A., C.E., 94 Hope st. 1887
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 860 Watson, Joseph, Chappell, Barrhead. 1882

- αWatson, J. Robertson, M.A., Professor of Chemistry, Anderson's College Medical School, Dumbarton road. 1891
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 875 Wilson, Thomas, 11 Anson road, Cricklewood, London, N.W. 1902
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 885αWorkman, Chas, M.D., F.F.P., & S.G., Professor of Pathology, St Mungo's College, 5 Woodside terrace. 1898
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